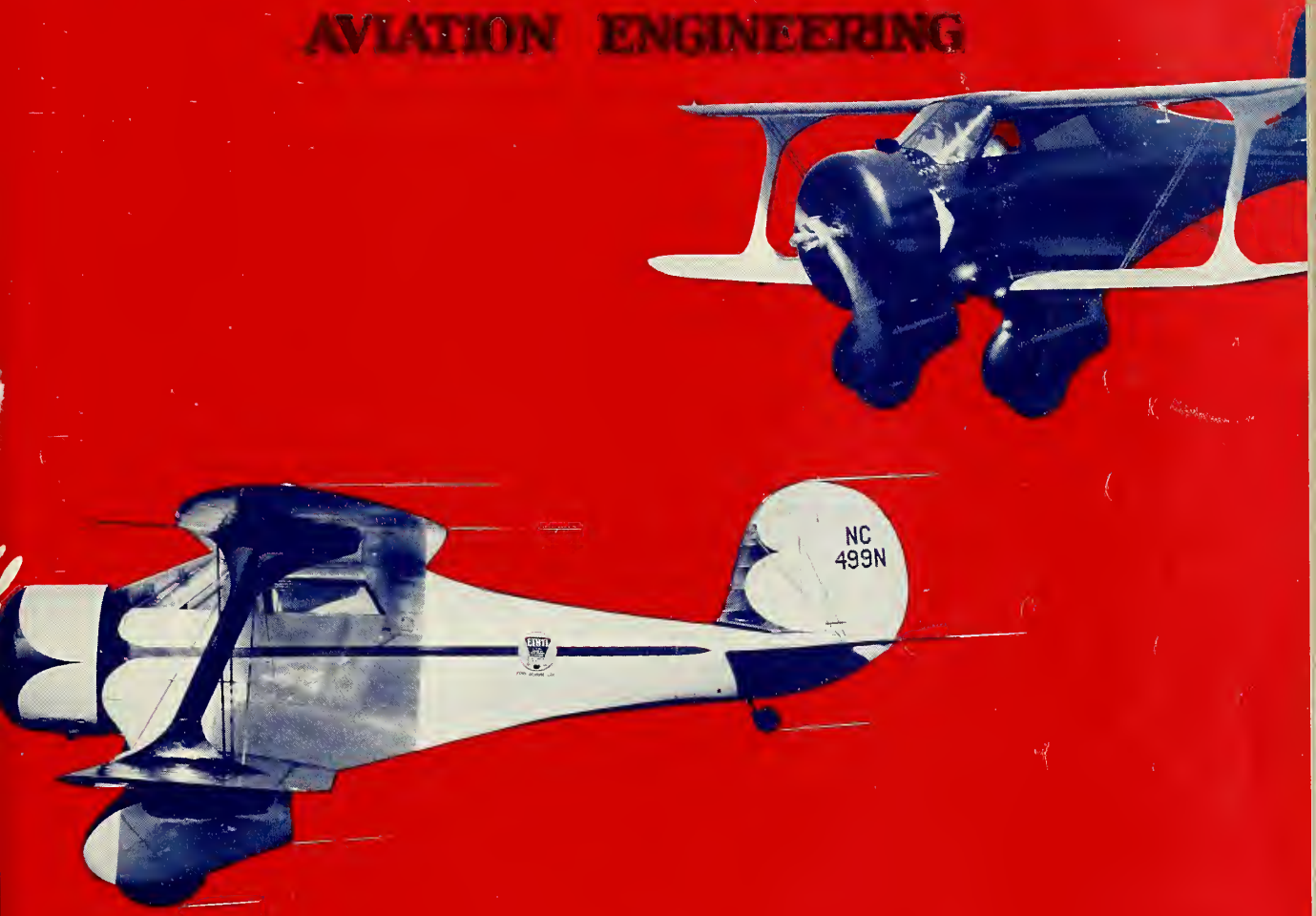
AERO DIGEST

INCLUDING

AVIATION ENGINEERING



JULY 1934

•

35 CENTS

AERO DIGEST *July, 1934* *Volume 25. Number 1.*

Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

• NAVIGATION COMPASSES • NAVY STANDARD COMPASSES • SENSITIVE ALTIMETERS •

• ICE WARNING INDICATORS • LEVEL FLIGHT INDICATORS • COMPASSES •

• ALTIMETERS • OIL, WATER, AND CABIN THERMOMETERS • ENGINE GAGE UNIT •

Kollsman *for Precision*

The Kollsman Instrument Mounting. For flush mounting from front of panel. The instrument fastens quickly in place by the turn of one screw.

Actual unretouched photograph showing instrument illuminated for night flying by Kollsman individual, self-contained lighting.

• TACHOMETERS • MANIFOLD PRESSURE GAGES • FUEL QUANTITY GAGE • AIR SPEED INDICATORS •

Kollsman announces two important advances in aircraft instruments—(1) individual self-contained lighting for night flying, and (2) new mounting for quick installation of instrument.

The lighting arrangement consists of a small electric lamp located at the center of the cover glass which illuminates pointers and dial uniformly, without glare or stray light. Bulb and glass are replaceable from the front of the panel. A rheostat switch varies the intensity of light. Snap connectors on the back of the case permit quick wiring. A double panel is not necessary, and the instrument dial is therefore fully visible from any practical angle. The lighting system requires no shielding. It does not cause radio interference, nor will it disturb magnetic compasses.

The instruments are quickly mounted flush with the panel from the front by the turn of a single screw. Together with their mounting collar, they are interchangeable with standard lug-mounted instruments.

Replacing instruments in service is accomplished in a fraction of the time necessary for lug-mounted instruments, appreciably shortening the time during which the airplane is out of commission—a particularly important consideration with scheduled and military flying. Because of greatly reduced handling, the instruments are less liable to damage, and the cost of maintenance is lowered.

Standard instruments, including those of other manufacture, can be equipped with Kollsman individual lighting and Kollsman quick mounting. Write for the Kollsman catalog.

[*The complete new line of Kollsman Instruments is being demonstrated in the Kollsman plane which is now touring the country*]

KOLLSMAN

PRECISION AIRCRAFT INSTRUMENTS

KOLLSMAN INSTRUMENT COMPANY
JUNIUS STREET, BROOKLYN, NEW YORK

B. G. Radio Shielded Mica Aviation Spark Plug, Model 4B-2-S

THE CHOICE OF THE AVIATION INDUSTRY

B. G. Regular Mica Aviation Spark Plug, Model 4B-2

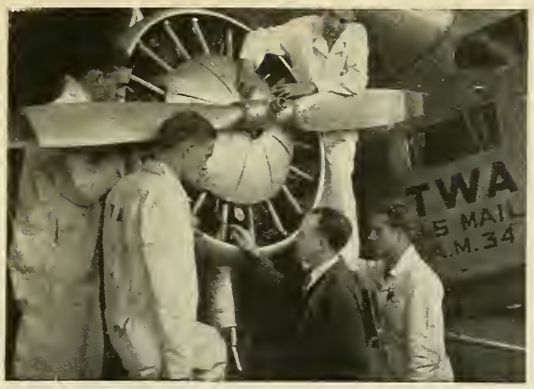
B. G. Mica Aviation Spark Plugs—patented in the United States and other countries—are standard equipment of the engine manufacturers and the transport lines. They are, also, the preference of the pilots.

The B. G. Corporation is contractor to the United States Army and Navy Air Services.

Constant improvement in these always better plugs has kept them abreast with every demand of the industry and gained for them an unequalled record of satisfactory performance under every flying condition.

THE B. G. CORPORATION

136 WEST 52nd STREET, NEW YORK **Cable Address: Golsteco, New York**



Earl Elleman, John Goiser, John Maas, and Alfred Jordon . . . four of many Parks graduates employed by TWA.

MAIL THIS COUPON
For Full Information About Courses

PARKS AIR COLLEGE, SECTION 7-AD,
PARKS AIRPORT, EAST ST. LOUIS, ILL.

Send me your illustrated catalogue, "Skyward Ho," and full information about the course checked.

☐ Executive Transport Pilot
☐ Aeronautical Engineering
☐ A. & E. Mechanics
☐ A. & E. Master Mechanics
☐ Limited Commercial Pilot

Name _____ Age _____

Address _____

City _____ State _____

PARKS TRAINING

IS PLANNED FOR SUCCESS—

That Is Why Hundreds of Successful Pilots, Mechanics, and Executives Are PARKS Men

What is behind a statement like this, from Jack Frye, Vice-President in charge of operations, TWA?

"Any unit in aviation should be interested in securing its future man-power from Parks Air College."

Just this—Parks fits men for today's and tomorrow's needs—not yesterday's. Aviation training must improve from week to week and from month to month to keep abreast of the industry.

Parks executives are in constant touch with officials of leading airlines and airplane manufacturers, who visit Parks Air College and who are visited at their own bases, plants, and offices. These executives, operations managers, chief pilots, and superintendents offer suggestions and advice which latest developments indicate are valuable. That is one reason why Parks training leads, has always led, and will always lead.

Where else but at Parks can you be assured that not a single detail of your training will be overlooked? Where else can you find a record of service and efficiency such as Parks Air College has made?

The choice remains with you. Will you select Parks Air College, a large and completely equipped school whose record of successful graduates cannot be equalled? For you, as for hundreds of other men who have already chosen Parks and are now holding good positions with factories, airports and airlines, the decision is clear and unmistakable.

Get "Skyward Ho!" our free 44-page book that maps your course to success in aviation. Decide now—and mail the coupon above, today!

Above—The Dormitory entronce.

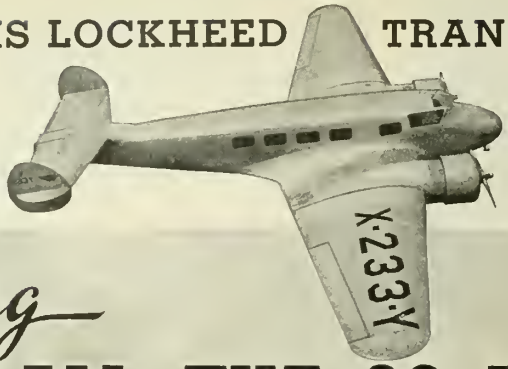
The Administrotion building, which houses the offices of the College.

PARKS AIR COLLEGE
WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Approved by U. S. Dept. of Commerce

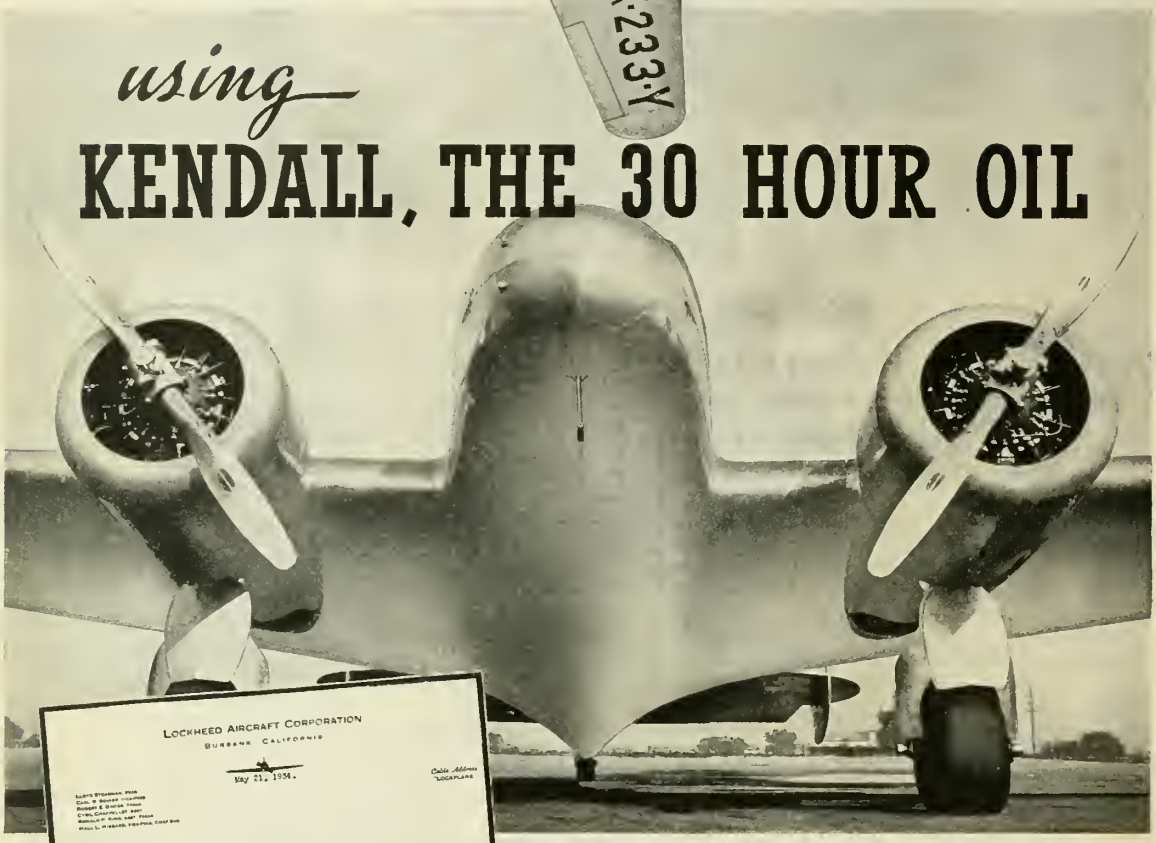
SECTION 7-AD PARKS AIRPORT EAST ST. LOUIS, ILL

AT 221 MILES PER HOUR SPEEDS THIS LOCKHEED TRANSPORT PLANE . . .



using

KENDALL, THE 30 HOUR OIL



LOCKHEED AIRCRAFT CORPORATION
BURBANK CALIFORNIA

May 21, 1934.

Cable Address "LOCKPLANE"

Mr. J. E. Shearer,
Kendall Refining Company,
Bradford, Pennsylvania.

Dear Mr. Shearer:

Following three months of rigorous flight testing, we are delivering our first Electra to Northwest Airways, Inc., and production is well under way on additional planes for Pan American Airways, Inc. and the Fokker Company in Holland.

The speed trials, you know, showed the Electra to be the fastest multi-motor transport plane in the world -- 221 miles per hour top speed.

You may be interested to hear that during the flight tests, the two Wasp Junior engines of the Electra were lubricated with Kendall J Oil to order to insure proper lubrication. Then, too, our service men like the handy, sealed "Quart containers in which Kendall Oil comes. They are convenient to handle and are an insurance against substitution or dilution.

Very truly yours,

LOCKHEED AIRCRAFT CORPORATION

by Carl B. Squier
Carl B. Squier
Vice President & General Manager

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL

IN his letter, Mr. Squier, Vice President and General Manager of the Lockheed Aircraft Corporation, says "during the test flights, the two Wasp engines of the Electra were lubricated with Kendall J Oil in order to insure proper lubrication."

"To insure proper lubrication" . . . what a wealth of significance those few matter-of-fact words convey! They express aviation's utter confidence in Kendall Oil . . . the almost universal high esteem in which aviators and airmen hold Kendall. They are a fitting tribute to the record that Kendall Oil has established in aviation service. A record of smooth, full-bodied lubrication under all conditions. A record of unfailing dependability. A record of sterling quality that stands up under gruelling speeds and high engine temperatures. A record of *perfect lubricating satisfaction!*

Try Kendall, The 30 Hour Oil, in the engine of your plane. Discover its excellence for yourself... see how it saves you money because of its ability to last for more flying hours per fill. Kendall is available in refinery-sealed cans at leading airports.

KENDALL REFINING COMPANY · BRADFORD, PA.

DALLAS AVIATION SCHOOL AND AIR COLLEGE, LOVE FIELD, DALLAS, TEXAS

Now You Can Learn to Fly Where the Mail is Carried!

WE FLY THE MAIL IN TEXAS

And Our Students Learn to Fly—Do Shop Work and Ship Work—Carry on Their Training Where They Can Actually See How Everything About the Air Mail Service Is Done

You Can SAVE

From

$25.00 Up to $150.00

By Enrolling NOW!

Our regular prices are the BEST TRAINING VALUES in America — but our special NRA Coupon offer still has several days to run. You can have one of these special Savings Coupons if you act at once!

Come To A GROWING School

Our present enrollment is the largest in our history. You cannot afford to delay. If you do—others will be slipping ahead of you every month—every week—every day!

Everything is in the student's favor here.

We have over $200,000 invested in equipment.

We have two full-size hangars—20 modern aircraft—30 air-cooled motors.

Our students work in large, fully equipped machine, motor and aircraft shops.

We own our own dormitories and cafe. Living costs are low.

Quick bus line from field to city—all hours—10c fare.

Dallas has over 300,000 population.

NO INCREASE IN THESE Course Prices

You save money and you save time when you train at Dallas. We have plenty of room, plenty of equipment, no delays and no unnecessary trimmings. Why-pay-more?

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$595
Private Pilots' Course	$545
Amateur Pilots' Course	$350
Master Mechanics Course	$300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five percent from the above prices for payment in full at time of enrollment.

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

These special inducements are for you—Now! Write or wire for Catalog and full information

Use This Coupon:—

Bigger— Busier— Better.

More students — more ships — more and better equipment will be found at D. A. S. than ever before. The reason—all America is learning that this school offers MORE for LESS.

And When We Say It's So — It's So!

We Play Safe—But We Get Places!

Veteran pilot instructors — safe and sane rules and methods —. ships and motors that never leave the ground unless they are in perfect condition — that's D. A. S. We protect our students!

Yet there is no other school in America where students get more action—every day—than here.

Love Field is a million dollar airport —one of the Nation's best.

Texas is a land of sunshine and good flying weather.

This is U. S. Government approved flying and ground school.

Dallas Aviation School and Air College
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

Transport Pilot ☐
Limited Commercial ☐
Private Pilot ☐
Master Pilot ☐
Master Mechanic ☐
Aviation Radio ☐
Complete Radio ☐

Name .....

Address .....

City .....

State .....

DALLAS AVIATION SCHOOL AND AIR COLLEGE

Major W. F. (Bill) LONG, Pres. — C. E. HARMAN, Gen. Mgr.

LOVE FIELD — DALLAS, TEXAS

WESTERN PENNA. PILOT TESTS NEW GULFPRIDE . . . VERIFIES MOTOR OIL'S ECONOMY

All-weather flying for 21 hours, 55 minutes consumes only 7 quarts . . . gets startling results with Gulf Aviation Gas, too!

READ this real record of aviation lubrication economy! Flying a Stinson Reliant monoplane, a business pilot (*) reports that his motor consumed only seven quarts of Gulfpride 120 Aviation Grade Motor Oil in 21 hours, 55 minutes in the air!

Here was a bonafide test. The pilot was flying for business purposes and made no attempt to find favorable conditions. All types of weather were encountered in the flight. Engine temperatures ranged from 140° to 155°F. A cruising speed of approximately 110 miles an hour was maintained.

Equally good results were obtained from Gulf Aviation Gasoline. For the entire flight, the pilot averaged 13 gallons per hour.

Significant! These records bear out the testimony of other pilots on similar flights. For a "tempered," economical lubricant, get Gulfpride. For a gasoline assuring you quick starting, uniform quality, and smooth engine performance, insist upon the new Gulf Aviation Gasoline with the higher octane rating. Ask for them at the popular airports.

(*) Name on request.

YOU'LL WANT TO SIGN THE COUPON

Recently questionnaires were sent to almost 800 airport managers. Would you like to know what they told us about aviation motor oils and gasoline? Then sign the coupon for a resume of the most important information.

GULF REFINING COMPANY, 27
Room 3800, Gulf Building, Pittsburgh, Pa.

Gentlemen: Yes, I'd like to hear what airport managers told you about aviation motor oils and gasolines. Please send me the resume —without any obligation.

Name.....

Company.....

Address.....

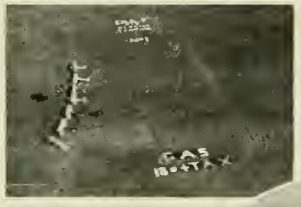
Other Air Men Say . . .

"We used Gulfpride in a 210 Continental Powered Kellett Autogiro . . . did a thoroughly satisfactory job . . . oil consumption was remarkably low." H. Yates Satterlee, Treas., Giro Sales & Service Inc., N. Y.

"On a 7,000-mile trip from South Texas to Maine, I used Gulfpride 120 . . . the amazing thing was that we used only one-half gallon of oil per hour for the whole trip." Pilot R. S. Lee.

"We have never sold anything but Gulf gas at this port." Acting Manager of a Massachusetts airport (name on request).

HERE'S INTERESTING NEWS . . .

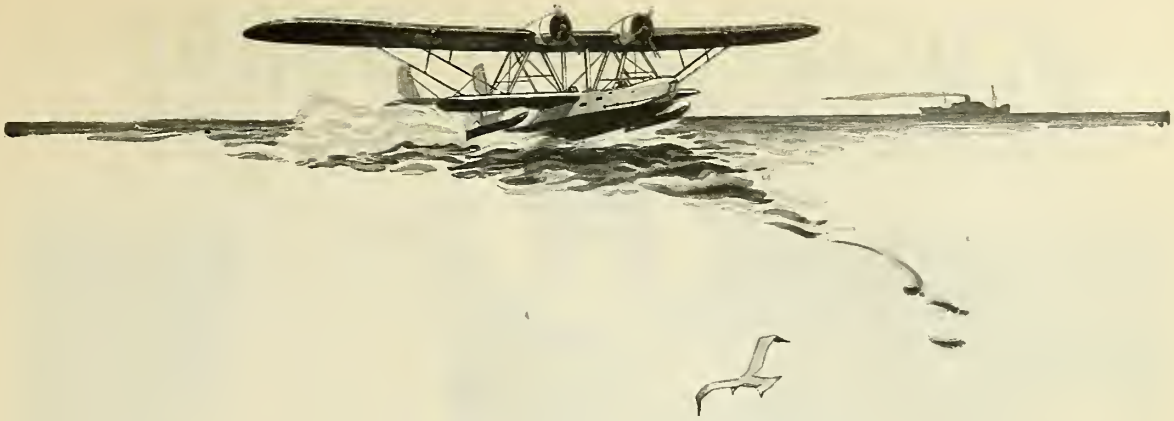


WORLD'S FIRST AIR SERVICE STATION, operated by Gulf on Long Island, N. Y., further proves Gulf's progressive part in aviation.

GULF GETS ON THE JOB and proves, by expert servicing, that Gulf aviation products are thoroughly supported by a trained, competent personnel.

CLASS ALWAYS COUNTS—so watch for the places where Gulfpride Motor Oil and Gulf Aviation Gas are advertised *and sold.*

GULF AVIATION PRODUCTS



Guardians of Our Coast and Commerce

EXTENSIVE coast lines and vast expanses of water are well within the radius of action of the Consolidated Long-Range Patrol Flying Boat. Twenty-four of these aircraft, known as the P2Y type, are serving the United States Navy . . . six of which recently established the world's record for a non-stop over-water mass formation flight of 2408 miles—from San Francisco to Honolulu. Powered by two Wright engines of 700 horsepower each, the Consolidated P2Y patrol plane has a maximum speed of 142 miles an hour and a cruising speed of 115 miles an hour, with an operating range of 3000 miles.

CONSOLIDATED AIRCRAFT CORPORATION
BUFFALO • • • NEW YORK

HERE'S PROOF

TEXACO
REG. T. M.

Twice within 90 days TRANSCONTINENTAL AND WESTERN AIR, INC., has hung up amazing new records with the aid of Texaco Aviation Products. ★ In both of these record runs, Texaco Aviation Products were used. ★ Isn't this striking and conclusive proof that you, too, will find an extra margin of *safety—speed—economy* in Texaco Aviation Products?

THE TEXAS COMPANY · *135 East 42nd Street, New York City*

NRA

IMPORTANT FOR DEALERS

There is a steadily increasing demand for Texaco Aviation Products. This means big profits for you right now. Ask us for further information.

TEXACO

TEXACO AIRPLANE OILS ★ TEXACO MARFAK GREASES ★ TEXACO AVIATION GASOLINE
TEXACO ASPHALT PRODUCTS (for runways, hangar floors and aprons and dust laying)

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER ONE

CONTENTS FOR JULY

COVER DESIGN

Three Beechcraft airplanes. Top, 690 horsepower Wright engine; center, 420 horsepower Wright engine; and bottom, 225 horsepowered Jacobs engine.

Published monthly by the Aeronautical Digest Publishing Corp. 515 Madison Avenue, New York N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5. Copyright 1934, by Aeronautical Digest Publishing Corp.

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

BOSTON: L. Mitchell, 80 Boylston St., Phone Hancock 5066. • CHICAGO: L. F. McClure, 919 No. Michigan Ave., Phone Superior 2802.
DETROIT: W. E. Fellows, 315 Stephenson Bldg., Phone Madison 9244. • LOS ANGELES: F. E. Samuels, 1129 Mohawk St., Phone Dunkirk 6332.
AERO DIGEST BUREAU: 14th and F Sts., Washington, D. C., Phone National 2299.

Erickson photo

Above the clouds at Lindbergh Field, San Diego, California, the new Ryan sport plane demonstrating its high speed of 142 miles an hour with a 95-horsepower Menasco engine

AIR
Hot and Otherwise

●

FRANK A. TICHENOR

● The bill to revise air mail laws (Bill S. 3170) provides for a drastic reversal of policy toward commercial aviation on the part of the government. This bill calls for the appointment of a commission to study, survey and report on the recommendation of a broad policy covering all phases of aviation, but the committee will have to carry on its studies during a period when, if the companies comply with the many other provisions of the same bill, conditions are changing so rapidly that study will be difficult. The study by the commission will also be highly prescribed. It is entirely possible that such a commission might consider unwise many of the provisions of the present bill. To get the best results and to proceed in the most orderly way, the commission should make its report first and defer the enactment of the legislation until after that report has been made and considered, or defer until June 1, 1935, the necessity for complying with the other provisions of the bill. This is not too much to ask of a commission which has the power to revive or ruin the aviation industry.

The first 19 of the bill's 21 sections will require a series of actions to be taken before the commission appointed in the last two sections reports, which will make it most difficult and, perhaps, impossible to carry into effect any policy recommended by the new commission that does not entirely agree with the actions taken under the first 19 sections.

Consider Present Status

It is possible that the commission may reach the conclusion that at least some portions of the former and present air transport systems are sound and should be continued. The commission to be really effective should have a full opportunity of considering the present status before that status is completely changed.

The new bill will subject this very small new business to the jurisdiction of five departments of the government; the Post Office, the Department of Commerce, the Interstate Commerce Commission, the National Labor Board, and the Comptroller General. Each one is given enough authority which will permit it to bankrupt the industry.

Many of the provisions of the bill are subject to severe criticism. For example, it provides that the Comptroller General shall speedily determine the issue of responsibility, in the event that the Postmaster General holds that a low bidder is not responsible. The statute does not provide any guide for direction to the Comptroller General as to whether or not the determination is to be based on some financial responsibility. Probably Congress intends to make financial responsibility the sole test, because the present bill will repeal the Watres Act, which contains provisions to secure experienced bidders, and operations over a fixed route of over 250 miles in length.

Illogical Rate Payment

The maximum rate of payment is not logical. The bill provides a payment not to exceed 33 1/3 cents per airplane mile for a mail load not exceeding 300 pounds, but if the mail load increases one-third, the base rate is increased only one-tenth. Such a provision will be an incentive to efforts on the part of operators to fly more small planes, rather than fewer large planes. A situation of this type, experience shows, would lead to constant bickerings between the Post Office Department and the operators.

The designation of four transcontinental routes and the eastern and western coastal routes as primary routes is mandatory. The Postmaster General has a permissive right to designate many other routes as primary. In view of the provisions prohibiting any one contractor from operating more than one primary route, the result of the operation of the new law may be to bring about a series of later readjustments of companies, with all of the attending confusion, losses to stockholders and lessening of economies in operation.

One section provides that the Interstate Commerce Commission will give a direction to the Postmaster General if only one bid is received, or if the bids appear to be excessive. This gives to a Commission which at the present moment knows nothing whatever about the subject, a power without any limitation or suggestions for guidance.

Limitation of the number of air mail route miles is made to forty million. This is within the Congressional authority, but the question arises as to the wisdom of curtailing a service which might break even, or even return a profit to the government, if permitted to increase to serve the demands of the air mail using public.

The Interstate Commerce Commission should not be limited to 33 1/3 cents per airplane mile for 300 pounds, or a maximum of 40 cents per airplane mile, because it may very well be that the Commission would favor the carriage of mail in very large ships. Provisions of the pending bill might tend, therefore, to hinder development.

The Commission is authorized to review the rates each year in order to be assured that no unreasonable profit is resulting by reason of the contracts. There is no mention of the possibility of losses, although the history of the great majority of air mail operating companies in the past has been one of losses rather than profits.

If the Commission is to have the power of fixing fair and reasonable rates, it should be permitted to take into consideration the company's investment and to fix a rate that will return a reasonable profit on that investment. Otherwise it will be increasingly difficult to secure funds for investment in air transport lines.

Power of Contract Termination

Provision for indefinite extension of contracts hereafter let is entirely inconsistent with the competitive bid idea. It means that the Interstate Commerce Commission will have the power of permitting companies in operation to continue in perpetuity. But the section also contains a provision that any such contract might be terminated at any time upon sixty days' notice. This is open to the very serious objection that, if the political complexion of the Interstate Commerce Commission should change, the air mail contractors, with many million dollars of private capital invested in their lines, would be at the mercy of a political situation over which they had no control. This would also prove a serious deterrent to the investment of substantial sums of money to private parties.

A much better arrangement would be for the grant of a certificate of conven-

(*Continued on page 57*)

"Four years from now there won't be enough engineering graduates to meet even the technical demands of the profession to say nothing of all the other opportunities for constructive leadership that lie ahead. No profession can ever be overcrowded that is based on so happy a combination of idealism, imagination, and rigidly sound thinking as that which characterizes engineering."—DR. H. N. DAVIS, President, Stevens Institute of Technology.

The MacRobertson Air Races

● When Sir MacPherson Robertson, a leading citizen of Melbourne, donated £15,000 and a gold cup to be given as prizes in air races from England to Australia, he sponsored what may turn out to be a most important aeronautical event. Incidentally this race will provide American manufacturers with an opportunity of matching their products against the best offered by other countries, with a chance of gaining greater export business should they be successful in the contest.

The event has turned out to be international in scope. With a field of sixty-four potential starters representing thirteen different countries, this MacRobertson International Air Race has drawn some of the outstanding pilots and aircraft from many parts of the globe. The United States, with 20 entrants, leads all other countries in the number of pilots, and with 27 aircraft, leads in the number of planes entered.

The greater number of aircraft over the number of entrants is accounted for by the fact that several foreign pilots have made a choice of American aircraft in preference to the products of their own countries. This is a fact to which we, in this country, can take pardonable pride. The foreign pilots have put aside nationalistic feeling, and in their desire to win, have placed their chances in the results to be achieved by American products, indicative of the esteem in which our aeronautical industry is held in other lands.

Foreign pilots who will fly American aircraft include Col. James Fitzmaurice (Irish Free State) in a Bellanca of special low-wing design; K.L.M. (Royal Dutch Airline), in a Douglas DC-2 transport; Sir Charles Kingsford-Smith (Australia), Lockheed *Altair;* J. Woods and H. C. Miller (*Australia*), Lockheed *Vega;* Lt. Marshall Lindholm (Sweden), Northrop *Delta;* Michael Detroyat (France), another Lockheed.

Our chances of winning the race are in the hands of some of our most capable pilots. Our aircraft will be representative of every type manufactured in the United States. Five Lockheeds will be flown by American pilots. Wiley Post undoubtedly will use his *Winnie Mae,* which has been considerably modified and prepared for high altitude, high-speed work. Ruth Nichols plans to fly an Altair. A third Lockheed was entered by Walter T. Varney and Laura Ingalls and R. F. Lape will also fly this type of ship.

Two Douglas's, understood to be twin-engined airliners, have been entered by Harold Gatty and Roscoe Turner, while Clyde Pangborn has chosen a Gee Bee monoplane. Among other American entrants and the type of planes they intend to fly are: Roy W. Ammel, General Aviation GA-38, tri-motored airliner; Keith Reider, a low-wing monoplane of his own design; Jack Wright, Warner-powered Monocoupe; Stanley C. Huffman, Stinson Reliant; David W. P. Clough (one of our youngest transport pilots), a Cessna and Louise Thaden, a Beech A-17-F.

With these men and women will ride the hopes of an entire industry. Whether or not we will be able to maintain or exceed the $5,500,000 worth of export business done in six months, may in a large measure depend on the success or failure of their efforts in the MacRobertson Race.

Six Cents An Ounce

● One provision in the new air mail bill that is favorable to the operators as well as to users of mail service is the establishment of a six-cent air mail rate. This two-cent reduction is 25 per cent less than the old rate and will bring greater volume of mail into our air mail planes.

Two years ago when the rates were increased from five to eight cents for each ounce or fraction thereof, volume dropped at a discouraging pace. The opposite effect will naturally follow now that the six-cent rate is an actuality.

As volume continues to increase, greater profits will accrue not only to the carriers, but also to the Post Office Department. It is not unreasonable to expect that the volume of air mail will become so increased that a further reduction in the rate will be deemed desirable. It is essential that the rates eventually should be decreased to a figure comparable to what our Post Office now refers to as its "first-class mail" rate.

However, the new rates, although only a couple of pennies lower than the old, are a step in the direction toward our long-cherished and frequently announced goal—*all first class mail by air.*

Maintaining America's Supremacy in the Air

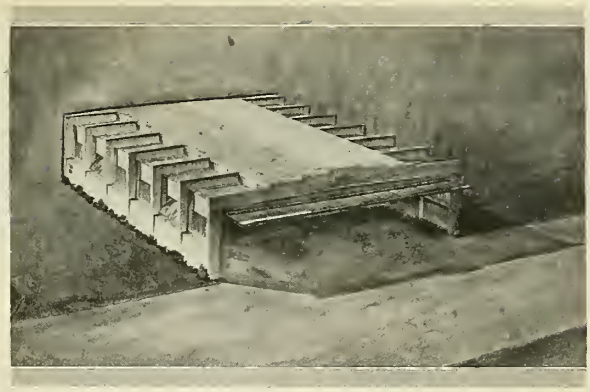
● The new Sikorsky S-42 built for Pan American Airways represents the graphic progress that has been made in this country toward catching up and surpassing any aircraft which our ambitious European neighbors have launched in the race for key positions on the important international trade routes.

The South American market particularly, and other foreign markets generally, represent lucrative fields for the export trade of many countries and covetous glances have been cast in those directions by Germany and France. To wrest leadership from America along the east coast of South America, the German subsidized Lufthansa has already begun a trans-Atlantic service over the Bathurst-Natal route. The steamship "Westphallen" is now used as a mid-Atlantic refueling base while development work is being pressed upon tri-motored Junkers seaplanes with which they expect to fly non-stop across the ocean between Europe and Brazil. The French, who have likewise been competing with the Americans in South America for the past five years, are ready to test the last of three airliners with which they hope to span the Atlantic non-stop, to give the French a faster service than either the Germans or the Americans enjoy between this rich commercial area and its industrial capitals on the continent.

The new Pan American Clipper, however, is both larger and faster than the French Government-built ships, and conclusively demonstrates the progress made in the development of marine flying equipment for America's international mail service. It is the climax of successive jumps from the Sikorsky S-36, created in 1928, with its 500 horsepower motors, 8,000 pounds gross weight and 90 mile per hour speed to the first "Clipper Ships" with 2,100 horsepower, 118-mile-an-hour speed and 34,000 pounds gross weight. Intermediate steps in this evolution, were the S-38, an 850-horsepower, 8-passenger amphibion; the 1,150-horsepower 17,000-pound Commodore flying boats, commercial sister ships of the present navy patrol boats which have been used by Pan American since 1929, and the S-41, an 1,100-horsepower, 12-passenger amphibion.

Fireproof Hangar Construction

J. W. BERETTA
Consulting Engineer



Artist's conception of proposed reinforced concrete rigid frame type of hangar

● In observing and studying all of the modern wonders of the airplane, it is possible that most of us are apt to pass over some of the less romantic details which are essential to flight and the piloting of aircraft.

With this remark, attention is called to that prosaic type of building known as the airplane hangar. Just as the roundhouse is seldom considered in connection with the romance of railroading, the garage with the development of automobiles, so is the importance of the hangar forgotten in connection with the airplane.

The Development of the Hangar

In the thirty years since the first flight, the development of the airplane has gone even further beyond that which shelters it. In fact, the actual structural principles in the design of a hangar and the materials of its construction have shown no real advancement in all the years that such a structure has been in existence. Architecturally the appearance of hangars has been somewhat improved and perhaps there has been some increase in size. Beyond this, however, the principle of the hangar today is the principle of the hangar built years ago.

Previous Types of Construction

At present, the construction of hangars has followed almost entirely three schools of thought. Where appearance meant little and the cost of the structure was important, it has been the practice almost entirely to utilize wood construction. This type of hangar has served long and faithfully and was very practical for its time.

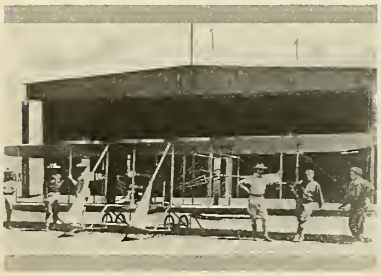
The next school of thought utilized steel trusses supported on steel columns and covered with steel or other sheeting. This type likewise served its purpose admirably, where appearance did not count and where first cost was the most important item. During the days when there was such a tremendous activity in airport and hangar construction, such buildings were built by the hundreds and many companies attempted mass production, then competed widely on a price basis, resulting in flimsy structures, many of which have since been destroyed by fire, wind storms or other causes.

A third school of thought in hangar construction utilized a composite type wherein steel or wooden trusses were supported on masonry walls, concrete, or steel columns, and in this type of construction more thought was given to the appearance of the building and some attempt made to achieve a degree of architectural beauty.

In the above evolution, there has really been only slight improvement and some of the major problems of a hangar remain unsolved. The problems of resistance to high winds have been solved by more rational and careful structural design. Those of fire, however, remain unconquered.

Fire Problems of a Hangar

At this point a few of the more salient thoughts in connection with hangar fires will be introduced. It is hardly necessary to call attention to the fact that some of the present-day airplanes are combustible machines. Practically all structural parts of earlier airplanes and even some parts of the modern planes are composed of wood, usually spruce, or other highly inflammable material. In turn, the fuselage and wings of the airplane are often covered with fabric coated with a cellulose dope, a highly inflammable agent. Then comes the gasoline fuel, which is not only inflammable in a liquid state, but explosive in a gaseous state.



Air Corps wooden hangar built about 1912

Many laymen, when confronted with this information, will state that modern airplanes are utilizing large amounts of metal for frame work, wing, and fuselage covering, and that this fact should make an airplane safe against fire. However, there still remains the gasoline, which may be likened to the dynamite cap ready to be set off by a wandering spark. When gasoline kindles, very little time elapses before the temperature of the duralumin, or other aluminum alloys used, is raised to its melting point and then to its flash point. Most engineers know that aluminum is a metal which is akin in properties to magnesium. All that is necessary to make aluminum and its alloys combustible is to raise them to their rather low burning point.

It is believed, therefore, that the engineer should go further into the design of structures to house airplanes by following a similar trend to the development of our modern fireproof office buildings. It is also believed that this trend should follow to some extent the design of fireproof warehouses, such as cotton compresses, etc.

All types of human endeavor reach their greatest heights when cooperative action and thought can be attained. This is especially true when one considers the importance of cooperation among the different branches of the engineering profession. Accordingly, the mechanical or aeronautical engineer must turn to the structural engineer for the answer to many of his problems, whether they be for the structure of an airplane or

Typical war-time military hangar built in 1917

Steel and sheet metal hangar built in quantities from 1927 to 1929

whether they be for the structure of the building that houses the airplane. In the development of a new field of hangar design, the structural engineer must draw largely from the knowledge developed by the bridge engineer. In turn, the aeronautical engineer must turn to the structural engineer for advice and counsel in the construction of a hangar.

In the following information, it is believed that an opportunity is presented for the aeronautical and structural engineer to profit from the principles evolved by the bridge engineer. However, the only particular principle which will be considered in this article will be that which has come to be known as the rigid frame principle of structural design.

Before proceeding with some of the actual applications of rigid frame design to hangar construction, it is well to give some thought to the plans which have been evolved in the construction of bridges. Rigid frame bridges have been developed extensively throughout the world and have successfully utilized both reinforced concrete and structural steel. In all cases the utilization of this design for bridges has shown many advantages and economies, in detail, cost and utility. In many cases the same advantages are noted when the principle is applied to buildings.

Radical departures from conventional structural design may be noted when specific rigid frame bridges are studied. In these, attention is called to the soffit slab at the bottom of the concrete girders, the roadway slab at the top (which together compose cellular construction), to the cantilever footings and the distribution of material in the structure. Here is the apparent complexity of a structure, designed as a unit rather than a conventional structure, made up of separate members having independent structural action. Through this new structural concept, long spans may be attained without sacrifice of slenderness and mass.

The reasons for the soffit slab are evidenced when the stresses in a restrained end beam are considered. It is almost axiomatic that the most efficient reinforced concrete member capable of resisting flexure is the T beam, and in rigid frame design where the moment reverses at the inflection points, the T is reversed, giving the rigid frame design tremendous advantages.

Before proceeding, however, it is advisable to compare a reinforced concrete rigid frame bridge with an equivalent bridge constructed of steel pony trusses. This comparison will give further inkling of the structural advantages where rigid frame construction is substituted for structural steel roof trusses in an airplane hangar.

Rigid Frame Hangar Design

For purposes of study the suggested adaptation of rigid frame bridge design to a long span building structure, will be introduced here. In this example, a suggested airplane hangar with a span of 85 feet will be considered. The structural principles in bridges are closely followed in this design, and the soffit slab, or reversed T, is introduced at the point of inflection. In the dimensions the total depth of the concrete girder carrying this span is 42 inches. An equivalent structural steel roof truss for this same load capacity and span would be approximately 9 feet deep.

Modern composite type hangar widely used on American military flying fields

Where the soffit slab is introduced, a monitor effect is attained with the introduction of louvres for ventilation and light, and the spacing of the concrete girders is approximately the same as that where structural steel roof trusses are used. The roof slab connecting these girders, which also serves to form the T, is haunched from 8 inches thick to only 3 inches at the center, attaining a highly economical roof framing.

Constructional Advantages

As might be expected slight changes are necessary. The most important is in the vertical column portion of the rigid frame. In this case, a fixed end column is utilized rather than a pin-connected effect. This is indicated by moving the vertical wall outward at the point of inflection, so that the T action of this vertical member is maintained throughout, just as that of the original girder.

In addition to the structural advantages it provides a space within the hangar for shelves, lockers, work benches, etc. For light and ventilation, the vertical walls are carried only to the width necessary for development of T action in the girder. The spaces between are filled with steel sash and the effect of the entire structure is a monolithic concrete building throughout, rather than the composite type of building used on many fields in this country.

It is interesting to compare this projected type of hangar with the framing of a conventional composite type designed by the author for the Galveston, Texas, Municipal Airport and illustrating a highly conventional and widely accepted type of framing. This particular hangar also happens to have an 85-foot clear span, which makes its comparison to the reinforced concrete rigid frame hangar more striking.

In the architect's perspective of the rigid frame hangar little attempt is made to show architectural embellishment, and the building as drawn is reduced to its simplest structural details. This shows a remarkable proof of an accepted adage of structural engineers, which says that any properly designed and proportioned structure has symmetry and beauty. In this

particular case, a highly modernistic form of architecture is achieved through strict adherence to structural proportions, accuracy, and scientific design.

The resultant architecture is the highly modernistic type, reflected in some of the buildings at the Century of Progress Exposition in Chicago, and of a large number of buildings constructed by German architects of the modernist school. Many types of architectural embellishment could be applied to this design, but possibly the most advantageous would be the cast-in-place decoration, which is so rapidly achieving favor.

Space does not permit a discussion of the actual scientific details of such a hangar design. Design estimates of this type of structure have been prepared for buildings up to 120 feet in span and, in all cases, the cost estimates compare favorably with those of a permanent type of composite hangar with proper architectural treatment.

Fire Resisting Advantages

Studies of airplane hangar fires have followed the trend of fire extinguishing rather than fire resisting. In the conventional steel, wood or composite hangar, gross violations have been made of principles long used in tiered buildings of the office or hotel type.

In the development of office buildings, structural engineers spend little time studying methods of extinguishing fires, but turn their attention to the design of structures which would be undamaged by any fires due to inflammable contents.

In the conventional hangar, fire due to inflammable contents is practically certain to destroy the building, whether or not the materials of construction are inflammable. Any excessively hot and intensive fire will quickly heat the structural steel trusses to the melting point, causing them to buckle and collapse. The same fire will quickly ignite a wooden truss.

Martinez St. Bridge, San Antonio, Texas, a reinforced concrete rigid frame type

Statistics issued by the Insurance Underwriters show that in 1930 alone there were twelve major hangar fires in the United States in which three or more airplanes were burned in addition to the building and its equipment. The total value of aircraft alone destroyed in these fires was estimated at about $2,000,000.

Returning to the reinforced concrete rigid frame hangar, it is pertinent at this time to bring out some of the fireproof advantages. Concrete has long been known as a fireproofing material for structural or reinforcing steel. In the modern tiered building, all structural steel columns, beams and girders are protected by two or three inches of concrete fireproofing, capable of resisting many hours of intense heat without damage to the structural member which it protects. Similarly, reinforced concrete primary structural members usually have two or three inches of additional concrete surrounding the reinforcing bars for the same purpose.

In the reinforced concrete rigid frame hangar, all specifications for fireproofing are easily followed, with reinforcing bars protected with additional concrete.

Fire Prevention

In any building, fire prevention and control is essentially important.

The ideal solution, in the opinion of the author, would be to construct the building of the same fireproof qualities as other types of buildings now in use, and at the same time provide all of the practical fire control and prevention devices. The plans for the rigid frame concrete hangar have been submitted to some Fire Insurance representatives for study, and the opinion has been advanced that such a building would carry a greatly lowered insurance rate than any now in effect. In addition, fire insurance on the contents would also be lowered.

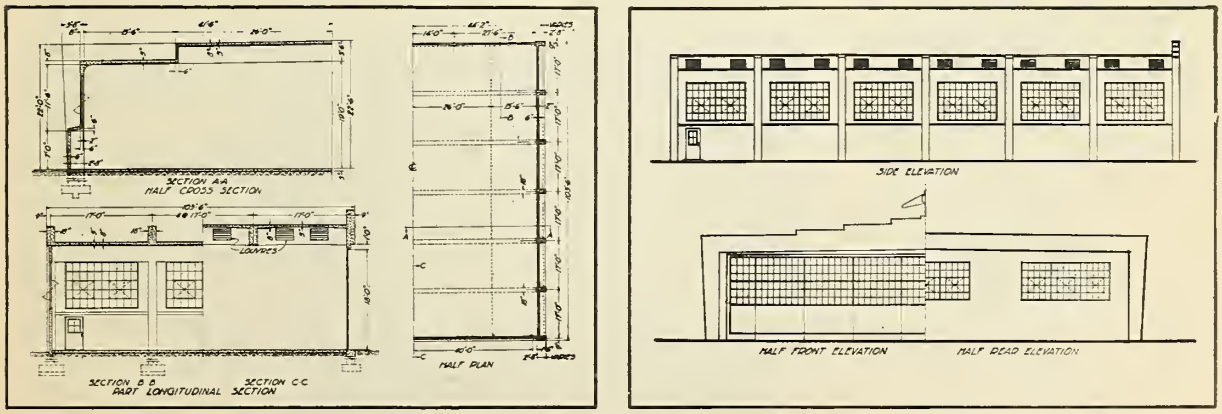
If, in addition to fireproof design, the proper fire prevention and control equipment is utilized the fire insurance rate on airplanes and hangars may be lowered.

Other Types of Fireproof Hangars

The hangars at Randolph Field, San Antonio, Texas, are of the composite type with steel roof trusses and columns and masonry walls. These hangars follow the very latest in hangar practice and have received excellent architectural treatment. However, the Air Corps is cognizant of the danger of fire and has had suspended below the roof trusses, gypsum ceilings, which it is believed will be sufficiently fireproof and fire resistant to prevent destruction of the trusses in event of fire. This method is undoubtedly effective and will do the work, but it is rather a roundabout way of fireproofing, is expensive and adds considerably to the dead weight of the hangar.

In the design of the proposed rigid

(*Continued on page 57*)



Structural details and elevations of a proposed rigid frame reinforced concrete hangar

The Lord High Executioners

CY CALDWELL

● The Lord High Executioner in Gilbert and Sullivan's opera The Mikado, found himself in an extremely delicate situation: either he must have someone to execute by a certain date, or he must execute himself. As slicing off his own head necessarily would prove an annoying and probably an awkward business, the Lord High Executioner endeavored to solve his problem by finding an innocent victim whose head might be removed with gusto and despatch. So, hunting desperately for a substitute, he compiled a little list of people who never would be missed.

The Lord High Executioners of the House Military Affairs Subcommittee, some of whom are coming up for reelection and possible political decapitation this fall, have placed on *their* little list the honored name of Major General Benjamin D. Foulois, Chief of the Army Air Corps. Evidently they have done this with the pious hope that the spectacle of a gaudy military execution will in some measure divert an annoyed electorate's attention from that dramatic Administration blunder known as The Great Air Mail Robbery, starring Jim Farley and a crew of undertakers.

One fly in the smooth ointment of this plan of the Lord High Executioners is the fact that Benny Foulois *would* be missed; another is the fact that General Foulois is not the sort of Army officer to take an unjust attack sitting down. The Executioners have charged him with offenses ranging from "dishonesty" to "gross misconduct," and have recommended that "before any substantial progress in the upbuilding of the morale and materiel of the Air Corps can be attained, Gen. Foulois must be relieved from his position as Chief."

American justice has come to a sorry pass when a Committee, obviously interested in excusing and explaining away an Administration blunder, can condemn one man for that blunder and endeavor to place the blame for the government's short-comings on his shoulders alone. It is just too big a splash of political whitewash to pass unnoticed by the critical eyes of the people, who recognize it for what it is: political buncumbe and hocus-

Courtesy of Chicago Tribune

pocus, designed to confuse and becloud the issue, to shift the blame.

It is not my purpose to endeavor entirely to excuse General Foulois for his part in the Army air mail fiasco in which twelve Army pilots lost their lives. I am convinced that some of the fault is his, but certainly not his alone, as this Committee would have us to believe. When Gen. Foulois told an Assistant Postmaster General that he was "quite certain" the Army could carry the mail, and that the men who would be flying the air mail routes had from 30 to 60 hours of night flying, he was mistaken, as events proved. No doubt he was honestly mistaken. But it was his responsibility, as Chief of the Air Corps, to *know* how well or how ill his pilots could fly:—what hours of night-flying experience they had had and how suitable or how unsuitable was the equipment they were to use. That he did not know this, or that, knowing it, he was unduly optimistic about the outcome of the experiment, the deplorable losses have demonstrated.

However, in common fairness to him, the Committee instead of charging him with inefficiency, inaccuracy, unreliability, incompetency, and mismanagement should have considered the position in which he was placed.

It has been reported that members of the General Staff had assured the White House that the Army *could* carry the mail. If this is so, General Foulois certainly found himself in a tough spot. If he disagreed he would be in the position of having to admit that as cross-country pilots Army pilots were the inferiors of civilian pilots—an admission that *no Army man anywhere in the world would make,* until forced to do so by incontrovertible facts. If he declared that Army pilots were insufficiently trained, that statement would be a blot on the reputation of the Army. General Foulois' whole life training as a gallant and courageous officer would practically *force* him to accept an *uncertain* risk rather than voice a *certain* admission that the Army Air Corps was incompetent. Yet this obvious bit of military psychology was ignored by the Committee. Foulois was blamed for everything, and the General Staff was permitted to slide out of all responsibility for the air mail fiasco. *Yet they command the Army and Foulois.* As for Jim Farley, the Highest of the High among the Lord High Executioners, his honor remained unsullied by even the slightest word of reproach by the Committee. As I wrote in an article in the May issue of AERO DIGEST, "That leaves General Foulois holding the well-known bag." From which, I might add, the equally well-known cat has now emerged. I expected him, mewing, whining, and yowling to the newspapers.

All of this is offered, not as an excuse, but as an extenuation which fairness would have taken into consideration. But fairness is hard to find among politicians, who normally are recruited from among the slickest of our citizens, most of them lawyers who have had much to do with law and but little to do with justice.

That the Army Air Corps, as a whole, is incapable of flying with any appreci-

(Continued on page 56)

U.S.S. Ranger Joins Navy

THE NEW aircraft carrier, U.S.S. *Ranger* became a unit of the U. S. Navy when she was commissioned and turned over by her builders to Captain Arthur L. Bristol, her commander. Colorful ceremonies attended the acceptance of the ship with Norfolk naval officers, thousands of enlisted men and the public witnessing the ceremonies.

Nearly 1,000 officers and enlisted men are already aboard the carrier, and more will be added from time to time until the entire personnel totals 1,300.

The *Ranger* is slightly more than 12,000 tons and in recent speed runs off the coast of Maine developed a cruising speed of 29.5 knots an hour and a maximum speed of 34 knots an hour (39.16 miles an hour). About 75 planes will be carried aboard the ship which is equipped with elevators and elaborate machine and repair shops. The *Ranger* is the first naval vessel designed as an aircraft carrier when the keel was laid.

ZMC-2 Being Overhauled

THE ONLY metalclad airship in the Navy, the ZMC-2, is still deflated and its inspection and annual overhaul is progressing according to schedule at the Naval Air Station, Lakehurst, N. J. Inspection showed the ship to be generally in excellent condition and capable of continued service.

Dr. L. B. Tuckerman from the Bureau of Standards made the inspection to observe the alclad hull of the ship.

Army Seeks School Site

A SPECIAL BOARD of the U. S. Army Air Corps has made an inspection of sites for a large aviation technical school in Houston to replace the one destroyed by fire almost a year ago at Chanute Field. Before definite action is taken, however, the board will decide whether to reestablish a school at Chanute Field or build another in some southern city.

Members of the board included Lieut. Col. Barton K. Yount, Maj. Herbert A. Dargue, Capt. Otto J. Trunk and Maj. E. B. Lyon.

MACON MAKES RECORD TRIP ACROSS COUNTRY

RETURNING FROM the naval maneuvers in the Caribbean Sea, the U. S. S. Macon, the Navy's dirigible, flew from Miami to Sunnyvale, Calif., in 51 hours, the best westward crossing she ever made. Quicker time could have been achieved if the ship had not been idled up the Pacific Coast for a daylight mooring. The cross-country trips were the longest training flights yet undertaken by the dirigible.

Navy Planes Reviewed by Roosevelt

185 NAVY planes, attached to the carriers *Saratoga, Lexington* and *Langley,* provided 50,000 persons, high government and military officials and President Franklin D. Roosevelt with the greatest thrill of the day when they put on a spectacular display of flying during the Presidential review of the United States Fleet as it steamed into New York early last month. Their mock bombing attack of a destroyer featured the events of the day and left little doubt concerning the fighting ability of our naval aviators.

The squadrons, under command of Rear Admiral John Halligan, included fighters, observers, scouts and bombers. After completing their formation flights, snake dances, dive bombing and aerobatic maneuvers for the President and his guests, two divisions flew over New York City before returning to their carriers. Among the types in the demonstration were Boeing F4B-4's, Grumman fighters, Curtiss Hawks and Vought Corsairs.

Newest fighter for U. S. Marine Corps, the P. & W. powered Boeing F4B-4

Army Asks Bids for 90 Planes

FURTHER ACTION intended to bring the Army Air Corps to greater efficiency and numerical strength was taken by the War Department when bids were invited for 90 new high-speed attack planes.

The department thus neared the halfway mark in its goal for 300 to 400 planes for 1935 under the new 3-year airplane program. Thus far bids have been asked on 175 new planes for 1935, of which 80 are bombers. Originally it was intended to buy only 30 attack planes, but this number has been increased.

Muhlenberg Commands Bolling Field

WITH THE transfer of Lieut. Col. Barton K. Yount to the Army Industrial College, command of Bolling Field, Washington, D. C., Army air base, has been taken over by Lieut. Col. H. C. Kress Muhlenberg.

Col. Muhlenberg came to Bolling Field from the Air Corps Tactical School, Maxwell Field, from which he recently was graduated.

Another change in the command of an Air Corps base took place when Brig. Gen. Charles H. Danforth succeeded Col. Albert L. Sneed as commander of Langley Field. General Danforth commanded Langley Field some time ago and subsequently was in charge of Selfridge Field and assistant to the Chief of the Air Corps at Randolph Field.

Army Officers Honored for Service

TWO AWARDS, each a cherished, coveted and singular honor, were given last month by the Army Air Corps to two officers for their outstanding work in the field of aeronautics.

Capt. Westside Larson, Rockwell Field, received the Mackay Trophy, the Army's highest award for aerial achievement for his contribution to aerial defense, method and procedure, demonstrated in a number of flights in which instruments alone were used in flying to and returning from designated points at sea.

The Distinguished Flying Cross, with Oak Leaf Cluster was presented to Capt. Albert F. Hegenberger for his initiative, energy and flights in testing the Air Corps system of blind flying and instrument landings. Secretary of War Dern made the presentation.

Illinois Unit in Maneuvers

A FORMATION flight, featuring maneuvers and exhibition flying was made over Northern Indiana by the 108th Observation Squadron, Illinois National Guard. The aerial activity was centered above the South Bend Municipal airport with eight planes, under the command of Capt. C. A. McElvain, comprising the unit.

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

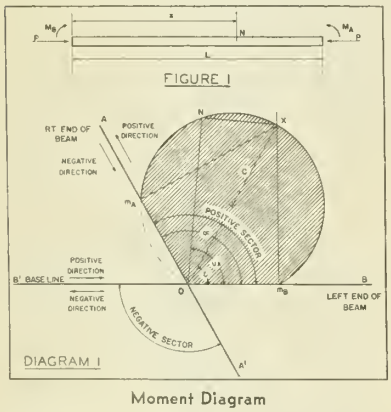
Analyzing Wing Beams by Means of Polar Diagrams

RAYMOND H. SCHWARZ
Oregon State College

• An accurate method of simplifying the strength calculations on wing beams, carrying complex forms of lateral loading or changes of section within beams, would gladly be received by the designing engineer. Existing analytical methods are often extremely laborious, necessitating the solving of a large number of simultaneous equations, but the Polar Method makes it possible to deal expeditiously with these types of wing beams. The purpose of the illustrated problems that appear in this paper is to show how the polar diagrams are applied in solving typical wing beams.

In June, 1928, the first article on polar diagrams was submitted by H. B. Howard in England (Ref. 1), describing the theory of the method as applied to single and continuous beams with end loadings. Since then new presentations of Mr. Howard's method enable one to apply it without necessarily mastering the theory. (Ref. 2).

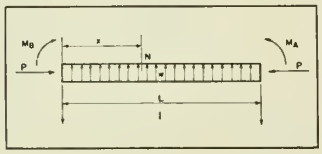
The principle of these diagrams is that polar instead of rectangular co-ordinates are employed. The bending moment diagram is built up entirely from arcs and circles drawn with reference to a pole point. The length of the beam is represented by an angular measurement, and the actual bending moment at any point is represented by a radius vector on the moment diagram.



Moment Diagram

Single bay beam, with end moments, end loads and constant moment inertia; no lateral loads

This paper was awarded second place in the Fifth Annual Boeing Scholarship competition offered by William E. Boeing. The award entitles the author to a choice of courses in the Boeing School of Aeronautics, Oakland, Calif., and he has chosen the Airlines Operation Course. This course, formerly the Master Mechanic Course, includes twenty hours of flying instruction.



Illustrative figure

The equations that will be derived are the fundamental equations upon which the Polar Method is based.

Nomenclature

M—true bending moment at any section.
x—distance from the left support.
y—deflected position of any section.
w—uniform running load on beam.
E—modulus of elasticity of the beam.
I—moment of inertia of any spar section.
S—true shear.
S'—apparent shear (due to lateral loadings only).
i—slope.
P—end load.
L—length of main bay.
a—length of sub-bay.
u^2—P/EI.
m—$M - w/u^2$ (a convenient quantity for diagram construction).
α—ua radians = 57.3 ua degrees.
β—defined in discussion.
Θ—defined in discussion.

The differential equation for beam deflection is:

$$M = EI\frac{d^2y}{dx^2} + Py \quad \ldots\ldots(1)$$

In the illustrative figure the moment at any point is:

$$M = M_1 + \frac{(M_2 - M_1)}{L}$$

$$x - \frac{wLx}{2} + \frac{wx^2}{2} - Py \quad \ldots\ldots(2)$$

Differentiating twice with respect to x:

$$\frac{d^2M}{dx^2} + P\frac{d^2y}{dx^2} = w \quad \ldots\ldots(3)$$

From the usual beam theory assumption:

$$M = EI\frac{dx^2}{d^2y}$$

$$\text{Then:}\frac{d^2M}{dx^2} + u^2M = w \quad \ldots\ldots(4)$$

Solving:

$$M = A\sin ux + B\cos ux + \frac{w}{u^2} \quad \ldots\ldots(5)$$

Replacing A and B, the constants of integration, by C. and ϵ:

$$M = C\sin ux + \epsilon\cos ux + \frac{w}{u^2}$$

By trigonometric substitution:

$$M = C\cos(ux - \epsilon) + \frac{w}{u^2} \quad \ldots\ldots(6)$$

And:

$$m = M - \frac{w}{u^2} = C\cos(ux - \epsilon) \quad \ldots\ldots(7)$$

For shear:

$$S = dM = -uC\sin(ux - \epsilon) \quad \ldots\ldots(8)$$

By differentiating (1):

$$S + Pi = S' \quad \ldots\ldots(9)$$

A curve representing equation (7) in polar co-ordinates is a circle passing through a pole O, with a diameter of C making an angle with a base line of ϵ. The construction of a moment diagram will be explained with reference to diagram 1.

Single Bay Beams

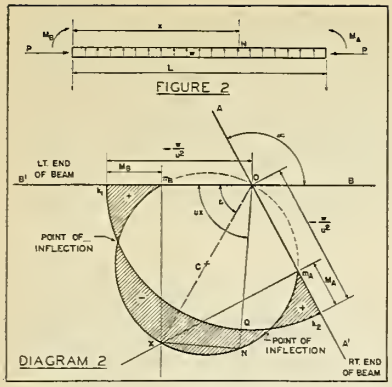
General steps in construction of polar diagrams:

1. Lay off the base line BB', representing one end ray, left end of the bay.

2. Choose a pole point O on BB' and draw in the right end ray AA' making an angle of α with BB'. The length of the bay is then represented in angular measurement by α.

3. The angle AOB is considered a positive sector and the angle A'OB' a negative sector. Any movement from the negative sector to the positive sector is positive. A displacement from B' to B and A' to A will then be positive.

4. Lay off the displacements on the respective end rays for the end moments



Moment diagram for Single Bay Beam, with uniform running load, equal end moments, end loads and constant moment of inertia.

M_A and M_B; all lines in the diagram will then have the units of a bending moment. Now we have three points through which the circle will pass, m_A, m_B and O.

5. A fourth point, termed the apex X, will be located at the intersection of normals to the end rays at m_A and m_B.

6. Other apices would be necessary where discontinuities in loadings are encountered. These will be explained later.

Discussion of Moment Diagram 1

The moment circle, Om_AXm_B, has for its diameter C making an angle with the base line of ε. It can then be seen that any point N, figure 1 distance x from the left end, is represented by the point N, diagram 1. The angle ux then represents, in angular measurement, the linear distance x on the beam. The moment at N is represented by the radius vector ON, and the shear by u_xNX. From the triangle ONX we obtain the following expressions:

Moment:

$$ON = C \cos (ux - \varepsilon) = M_N \quad \ldots\ldots\ldots (10)$$

Shear:

$$u_xNX = C \sin (ux - \varepsilon) \quad \ldots\ldots\ldots\ldots (11)$$

When looking along a radius vector in the positive direction the shear is positive when measured to the right.

Then:

$$S_N = -u_xNX$$

The true shear then changes from positive to negative as we pass from m_A to m_B while the apparent shear is constant and positive.

$$S' = \frac{M_A - M_B}{L} \quad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Discussion of Moment Diagram 2

This diagram illustrates the moment diagram for a beam with a uniform running load, all other conditions being the same as in figure 1. All loadings that act upward are considered positive and downward negative.

The load, tending to reduce the positive moment within the bay, introduces a new term, "the loading arc." When w and the end moments are positive the arc will lie in the lower sector. This is obvious from the quantity $m = M - w/u^2$. The loading arc k_1k_2 is laid off with O as a center and w/u^2 as a radius. The support moments are measured from k_1 and k_2. The moment is the vector intercept between the loading arc and the moment circle. At point N it is represented by the vector QN. The correct procedure for concentrated loads will be fully covered in the continuous beam problems.

Continuous Beams

Continuous beams can be solved when the external loading, end moments and end loads are known. The beam is broken up into two separate bays, each within supports. In solving this type of beam two diagrams are generally required for each bay. The first diagram is a skeleton diagram from which values are obtained that will enable one to determine the inner-support moment. The second diagram is the actual bending moment diagram and can easily be drawn when the inner-support moment is known.

With the skeleton diagram linear relations can be set up between the moments, shears and slopes at the two ends of each bay, such as is done in the ordinary theorem of three moments. Having found these relations, the inner-support moment is readily determined.

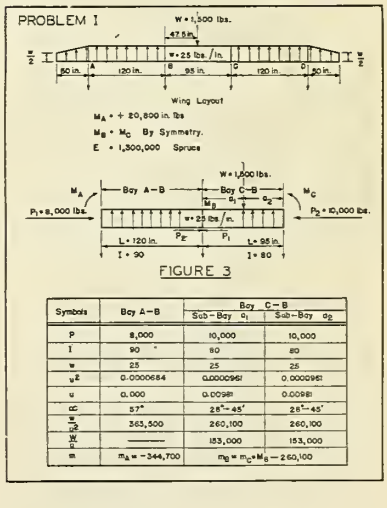
Let us now consider a typical wing beam such as might be found in the upper wing of a biplane (Problem 1).

Discussion of Skeleton Diagram 3

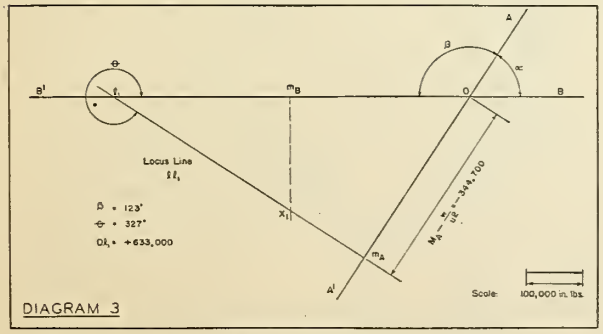
The same sign rule for sectors applies here as before. In dealing with the bays A-B and C-B, directions from A to B and C to B are taken as positive, making B the common point of reference. It will then be necessary before equating the two expressions for slope on each bay to change the sign of one.

Since the quantity m_A is laid off on the end ray AA', the quantity m_B will be represented somewhere on the base line BB'. Assume the point to be as shown in diagram 3. If normals are drawn to the points m_A and m_B they will intersect at an apex X_1 which would be one of the four points through which the moment circle of the moment diagram would pass if m_B were correctly located. Clearly the line m_BX_1 represents the shear at m_B for the point as chosen, and m_AX_1 represents the shear at m_A. The line normal to m_A is called the locus line l_1 and intersects the base line at l_1. The angle AOB' is termed β and the counter-clockwise angle from the base line to the last locus line is designated by Θ. The important quantities from the diagram are: the intercept Ol_1, and the angle Θ. Movements toward B' are reckoned positive.

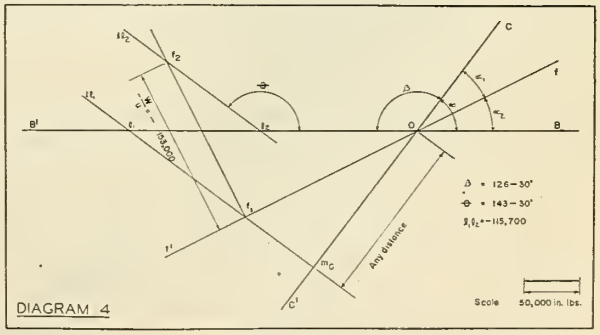
From equation (8) and diagram 3:



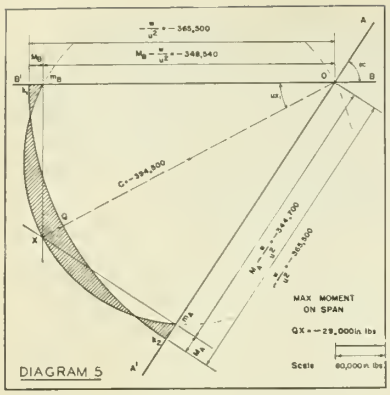
Symbols	Bay A-B	Bay C-B	
		Sub-Bay a_1	Sub-Bay a_2
P	8,000	10,000	10,000
l	90	80	80
w	25	25	25
w/u^2	0.0000684	0.0000961	0.0000961
u	0.000	0.0098	0.0098
α	57°	28°-45'	28°-45'
$\frac{M}{u^2}$	363,500	260,100	260,100
$\frac{W}{u^2}$	———	153,000	153,000
m	$m_A = -344,700$	$m_B = m_C + M_B = 260,100$	



Skeleton diagram for bay A-B, problems I and II



Skeleton diagram for bay C-B, problem I



Moment diagram for bay A-B, problem I. Uniform running load, unequal end moments, end loads and constant moment of inertia

$$\frac{S_B}{u_B} = m_B X_1$$

$$\tan\Theta = -\frac{S_B}{u_B\,(O\,l_1 + m_B)}$$

Since:

$O\,l_1 = m_A \sec\beta$

Then:

$$\frac{S_B}{u_B} = (m_A \sec\beta + m_B)\tan\Theta \quad \ldots\ldots (13)$$

From equations (9) and (12):

$$Pi_B + S_B = \frac{(M_B - M_A)}{L} + R_B \quad \ldots\ldots (14)$$

Where:

R_B is the ordinary reaction at B due to the lateral loadings, assuming a pin joint at A and B and no end load.

From equations (13) and (14) the slope at point B, in terms of M_A and M_B, can be determined.

Discussion of Skeleton Diagram 4

When concentrated loads are encountered the bay is divided into separate sub-bays, the separation being at the point of application. The constants C and ε will change as the moment diagram passes from one side of the load to the other. It is assumed that the moment and slope of the spar is the same on each side of the load point, and the apparent shear changes by W on passing the load point.

The skeleton diagram is shown in diagram 4. The normal at m_C intersects the sub-bay ray at f_1. At each ray a measurement along the line, of w/u^2, takes account of the change of running load w, and a measurement perpendicular to the line, of W/u, takes account of the concentrated load W. For running loads a positive measurement is made by a displacement from the negative sector to the positive sector when looking along the ray in the positive direction. Likewise for a positive concentrated load the measurement is made by a displacement to the right. Since W is negative, the displacement will be to the left. With these loading displacements, the projection $l_1 l_3$ on the base line, would always be the same regardless of where the initial point, m_C on the end ray CC′ was chosen. It is, however, very helpful to make an approximation of the end moments so that the sign of the distance projected can easily be determined. See addition II.

Shear:

$$\frac{S_B}{u_B} = (m_C \sec\beta - l_1 l_2 + m_B)\tan\Theta \quad \ldots (15)$$

Slope:

$$Pi_B + S_B = \frac{(M_B - M_C)}{L} + R_B \quad \ldots\ldots (16)$$

From equations (15) and (16) the slope at B, in terms of M_C and M_B, can be determined. By equating the two values of slope for the two bays (changing one sign) we get a relation between M_A, M_B and M_C, from which M_B may be calculated as shown below.

Calculations Bay A-B

From (13):

$S_B = 0.00537\,M_B + 1435 \quad \ldots\ldots (a)$

From (14):

$8{,}000\,i_B + S_B = 0.00834\,M_B + 1328 \quad \ldots\ldots (b)$

Combining (a) and (b):

$8{,}000\,i_B = 0.00297\,M_B - 107 \quad \ldots\ldots (c)$

Calculations Bay C-B

Similarly from (15) and (16)

$10{,}000\,i_B = 0.00494\,M_B - 13 \quad \ldots\ldots (d)$

Combining (c) and (d):

$M_B = +16{,}960$ in. lbs.

Discussion of Moment Diagrams Problem I and II

The moment diagram for bay A-B (diagram 5) is constructed as explained for diagram 1 and 2. For bay C-B (diagram 6) a separate moment circle is drawn for each sub-bay, necessitating the use of two apices. Apex X_2 for sub-bay a_2 is located at the intersection of the locus line $l_1 l_2$ and the normal to m_B. From X_2 a line parallel to $f_1 f_2$ cuts $l_1 l_1$ at X_1, locating the apex for sub-bay a_1.

The results of the beam analysis appear in the following table:

Method of Solution	Support Moments M_A in. lbs	Support Moments M_B in. lbs	Bay A−B Max. Mom. on Bay	Bay A−B Location of Max. Mom. From Left End-ins.	Bay C−D Max. Mom. on Bay	Bay C−D Location of Max. Mom. From Left End-ins.
PROBLEM — I						
Polar	+20,600	+16,960	−29,000	61.8	+26,900	47.6
Precise Equations	+20,800	+15,610	−29,600	61.8	+28,200	Cannot be Calculated (Ref 4)
PROBLEM — II						
Polar	+20,900	+26,300	−23,500	62.4	−1,700	47.2
Precise Equations	+20,800	+26,100	−23,000	61.7	−1,800	48.1

Results from analysis (slide rule calculations)

Problem II is exactly the same as Problem I except the concentrated load has been removed from bay C-B.

The precise equations used were: (Ref. 3.)

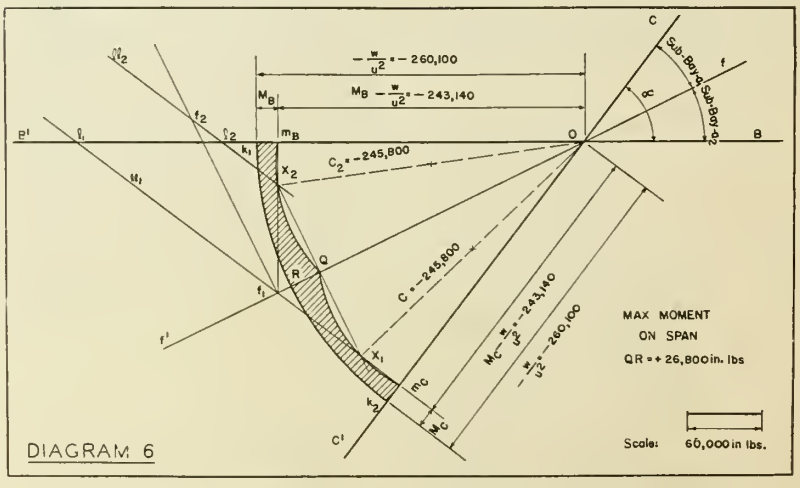
Bay A-B (Diagram 5)

Location of maximum moment:

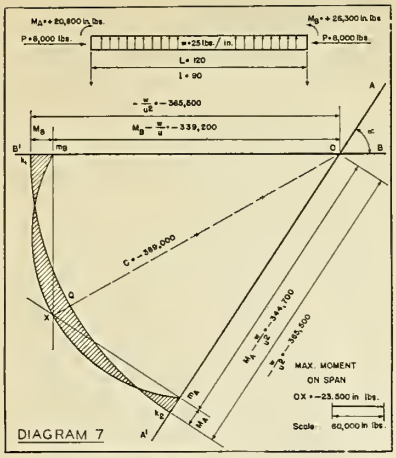
$$\tan\frac{x}{j} = \frac{D_2 - D_1\cos\frac{L}{j}}{D_1\sin\frac{L}{j}}$$

Maximum moment:

$$M_{max.} = \frac{D_1}{\cos\frac{x}{j}} + wj^2$$



Moment diagram for bay C-B, problem I, uniform running load, concentrated load, constant moment inertia, equal end moments, end loads



Moment diagram for bay A-B, problem II. Uniform running load, unequal end moments, end loads and constant moment of inertia

Bay C-B (Diagram 6)

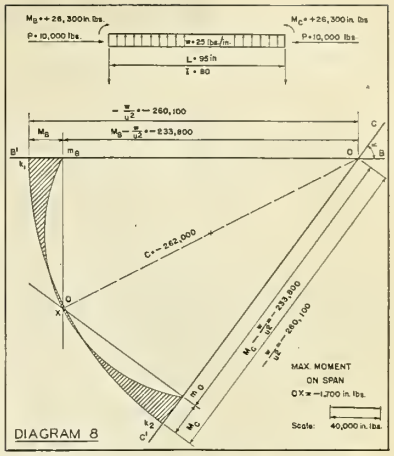
Maximum moment (Ref. 4):

$$M_{max} = \frac{\sin\frac{x}{j}}{\sin\frac{L}{j}} (D_2 - j \Sigma W_2 \sin\frac{L - a_2}{j}) + wj^2 + (\cos\frac{x}{j} - \sin\frac{x}{j}\cot\frac{L}{j}) (D_1 - j \Sigma W_1 \sin\frac{a_1}{j})$$

Because of space limitations the description of the Polar Method has been very brief, demonstrating its application to only a few simple cases. The range of its application is almost unlimited, covering practically all combinations of loading and sectional variation. For treatment of more involved cases one can refer to (Ref. 1 and 5). In (Ref. 5) the analytical solution with polar equations has been considerably elaborated upon, demonstrating the universality of the polar equations.

When the precise equation is employed a result is obtained at only one particular point. For further information the equation must again be solved. In some cases these equations can not be used to determine the maximum moment within bays, (Bay C-B of Problem I) the solution finally being obtained through calculations at several points.

With the Polar Method after calculating the inner-support moment, the moment diagram can be drawn from which the whole beam can be analyzed by making simple conversions. This diagram clearly pictures the stress distribution on the beam. From the diagram one can easily visualize the effect of changing the loads and sections on the beam. In this respect the method is a time saver and with its accuracy it should prove to be a valuable tool to the stress engineer.



Moment diagram for bay C-B, problem II. Uniform running load, equal end moments, end loads and constant moment of inertia

LIST OF REFERENCES

Reference 1. Technical report No. 1233—Aeronautical Research Committee of England. 1928-1929.

Reference 2. A Graphical Method of Stressing Aeroplane Spars, by D. Williams, *Flight*—March and April, 1931.

Reference 3. Airplane Structures, by Niles and Newell. 1929.

Reference 4. Air Corps Information Circular, Report 3598. June 15, 1932.

Reference 5. The Stresses in Aeroplane Structures, by H. B. Howard. 1933.

Recent Aeronautical Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Mechanical movements (for controllable-pitch propellers). F. A. King, Los Angeles, Calif. (1,947,853)

Parachute apparatus. Hilbert G. Hamer, Letchworth, England, assignor to Irving Airchute of Great Britain, Ltd. (1,958,000)

Automatic steering system. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Co. (1,958,258)

Automatic steering equipment. H. I. Becker, Schenectady, N. Y., assignor to General Electric Co. (1,958,259)

Aircraft having sustaining rotors. Harold F. Pitcairn, Bryn Athyn, Pa., assignor to Autogiro Co. (1,958,444)

Retractable wing and landing gear. Nicholas J. Medvedeff, Beechurst, N. Y., assignor to Aircraft Improvement Corp., New York, N. Y. (1,958,486)

Airplane. Randolph F. Hall, Rochester, N. Y. (1,959,236)

Airplane. Ernest Hedlof, South Chicago, Ill. (1,959,270)

Aircraft altitude indicator. Wesley L. Smith, Cranford, N. J., assignor to Eclipse Aviation Corp. (1,959,309)

Aircraft having rotatable sustaining means. Harold F. Pitcairn, Bryn Athyn, Pa., assignor to Autogiro Co. (1,959,444)

Automatic variable-pitch propeller. Chandley W. Lambert, Cleveland, Ohio. (1,959,631)

Airplane and other aricraft. Archibald F. Nash, Kingston-on-the-Thames, England. (1,959,987)

Helicopter. Corradino d'Ascanio, Rome, Italy. (1,960,141)

Catapult for launching airplanes. Ernst Heinkel, Warnemunde, Germany. (1,960,264)

Apparatus for distinguishing the fairway for ships and aircraft. Walter Hahnemann, Berlin-Marienfelde, Germany. (1,960,439)

Wind direction and velocity indicator for airplane landing fields. Walter H. Frank and Thomas Carroll, Washington, D. C. (1,960,735)

Braking mechanism for airships, Ellingwood H. Towle, Larchmont, N. Y., assignor to Secretary of War. (1,960,762)

Light beacon for air traffic and for navigation purposes. Pieter van Braam van Vloten, The Hague, Netherlands. (1,961,116)

Insulating composition (aircraft having cabins jacketed with an insulating composition comprising fibers of organic derivatives of cellulose). Camille Dreyfus, New York, N. Y. (1,961,208)

Aircraft propeller cowling. Carl H. Hall, San Diego, Calif. (1,961,214)

Magnetic compass for aviation, navigation, and other purposes. Eugene Vion, Paris, France. (1,961,312)

Shock absorber for airplanes. Herbert E. Tucker, Chicago, Ill., assignor to Cardwell Westinghouse Co. (1,961,406)

Frame for access opening for use in aircraft construction. Charles E. Hathorn, Hempstead, N. Y., assignor to Curtiss Aeroplane & Motor Co., Buffalo, N. Y. (1,961,584)

Pitch-angle control mechanism for aircraft propellers. Edwin K. Lefevre, Chevy Chase, Md., assignor to Whitfield Engineering Co., Washington, D. C. (1,961,671)

Brake. Frederick C. Frank, South Bend, Ind., assignor to Bendix Aviation Corp. (1,961,848)

Brake. Karl L. Herrmann, South Bend, Ind., assignor to Bendix Aviation Corp. (1,961,858)

Airplane construction. Selden T. Williams, Bellerose, N. Y. (1,961,996)

Filtration of Sound in the Airplane

PART TWO: ACOUSTIC FILTERS

ALEXANDER KLEMIN

Daniel Guggenheim School of Aeronautics, New York University

● In Part 1 we reviewed certain electrical and mechanical principles which have a close analogy to certain acoustical phenomena. We can now pass readily to the acoustical ideas themselves.

Simple Conception of a Plane Sound Wave

As a rule sound waves are spherical waves radiating from the center of a sphere. At some distance from the source the "front" of the sound waves may be considered to be the same as a plane sound wave. If a sound is traveling in a tube it certainly can be considered as a plane wave, and in our discussion of sound filtration, we can assume all waves to be plane waves.

The simplest conception of a plane wave is that illustrated in figure 1, where a piston is moving to and fro with such simple harmonic motion that the velocity may be represented by the equation $v = V_0 (\cos \omega t + i \sin \omega t) = V_0 e^{i\omega t}$ with the real part of the velocity equal to V cos ωt.

If the piston is taken to be at its neutral position at time $t = 0$, then its velocity is greatest at time $t = 0$, and the pressure immediately adjoining the piston is evidently also greatest at the same instant. As the piston slows down in its motion to the right, the displacement of the sound wave to the right will relieve the pressure, and it will fall to zero pressure above atmospheric. Then as the piston moves to the left, the excess pressure and condensation will evidently be followed by negative pressure and rarefaction. It is fairly clear that the pressure will be in phase with the velocity.

We can therefore say that the excess pressure $p = p_0 e^{i\omega t} = p_0 (\cos \omega t + i \sin \omega t)$ where $p_0 \cos \omega t$ is the real part of the excess pressure.

The displacement of the piston will evidently lag 90° or $\pi/2$ behind the excess pressure and the displacement.

The plane sound wave will be propagated along the tube with similar cycles of pressure, particle displacement, and velocity at any point in the tube, as at the point A where the piston is at work.

However, if the velocity of sound in the medium is C then at the point of B, a distance L from A, the pressure cycle will lag in time by an amount $t = \frac{L}{C}$.

and the pressure at point B will be represented by

$$p = p_0 \left[\cos \omega \left(t - \frac{L}{C} \right) + i \sin \omega \left(t - \frac{L}{C} \right) \right]$$

It is convenient and customary to use the following notation:

(1) $\omega = 2\pi n$ where n is the frequency of the piston and hence of the sound wave.

(2) $C = \eta \lambda$ where C = velocity of sound and λ = wave length

(3) $\frac{\omega}{C} = K$

(4) $\frac{\omega}{C} = \frac{2\pi n}{\eta \lambda} = \frac{2\pi}{\lambda} = K$

with this notation $\frac{\omega L}{C} = KL$, and p at the point B is $p = p_0 \left[\cos (\omega t - KL) + i \sin (\omega t - KL) \right]$

In dealing with short filters, we can assume that everything occurs at *one* point in the filter, and therefore Kl is a constant.

Putting $\omega^1 = \omega t - KL_1$

$$p = p_0 \left[\cos \omega t^1 + i \sin \omega t^1 \right]$$

and we can neglect the prime and simply write

$p = p_0 (\cos \omega t + i \sin \omega t) = p_0 e^{i\omega t}$

Velocity of a Sound Wave

It can be readily shown that for a gas $C = \sqrt{\frac{dp}{d\rho}}$ where compression and change in density occurs adiabatically. We can see roughly why this should be. Acceleration should be proportional to p/ρ and velocity at a given point should be proportional to the square root of the acceleration. Classic texts of course develop this idea much more accurately.

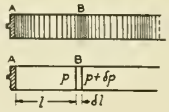


Figure 1
Simple conception of a sound wave

Figure 2
Helmholtz resonator

We are concerned with accurate mathematical expressions only in so far as the filter is concerned.

A very careful distinction should be made between the velocity of propagation of a sound wave, and the velocity of a particle vibrating to and fro about a point of equilibrium. So small is the vibration of the particle, that even with a high frequency the velocity is minute.

Acoustic Elements, the Helmholtz Resonator

We shall now consider the acoustic elements which are used in the construction of an acoustic filter.

The first is the Helmholtz Resonator which consists of an enclosure communicating with the external medium through an opening of small area. The opening may be flat as in figure 2, or in the form of a neck, and the resonator can be separated into its components. Thus inside the resonator there is a volume of air V_L which is alternately compressed and expanded by the movement of the air in the opening. This part of the resonator is analogous therefore with the "stiffness" element of a mechanical vibrating system.

The air at the opening moves as a whole and so provides a mass or inertia element.

At the opening there is a radiation of sound into the surrounding medium leading to the dissipation of acoustic energy, and providing an element analogous to the damping element in the mechanically vibrating system, or the non-inductive resistance of the electric circuit.

We shall first calculate the stiffness coefficient. As the expression for the velocity of a wave in a gas fluid is

$$C = \sqrt{\frac{dp}{d\rho}}, \quad dp = C^2 d\rho$$

If the volume of the resonator is decreased adiabatically without its mass being changed, we must have

$$d(V_L \rho) = 0 = \rho\, d\, V_L + V_L\, d\rho$$

so that $d\rho = -\rho \frac{dV_L}{V_L}$

Hence $dp = -\rho C^2 \frac{dV_L}{V_L}$.

If the displacement of the air in the neck

of the resonator is denoted by x, measured positively into the inside of the resonator, then a positive displacement in the neck corresponds to a decrease of the volume in the resonator and we have

$$dV_L = -Sx$$

where S is the cross-sectional area of the opening. Hence we can write dp or simply excess $p = \frac{\rho C^2 Sx}{V_L}$. The total force acting to produce the volume change is then $\frac{\rho c^2 S^2 x}{V_L}$.

The mass element is evidently $\rho_0 SL$ where L is the length of the neck. It is customary to introduce the quantity $c_0 = S/L$ which is termed the conductivity of the opening. The mass then becomes $\rho S^2/c_0$.

An expression for the dissipative force, due to dispersion of sound at the opening, is given in texts on acoustics as

$$\frac{\rho\omega K}{2\pi} S^2 \frac{dx}{dt} = \frac{\rho\omega K}{2\pi} S^2 x.$$

Where $K = 2\pi/\lambda$. This expression is of small interest since we shall neglect dissipative forces in the calculation of a filter.

The equation of motion may now be written as:

$$\frac{S^2}{c_0}\frac{d^2x}{dt^2} + \frac{\rho\omega K}{2\pi} S^2 \frac{dx}{dt} + \frac{\rho C^2 S^2 x}{V_L} = pS$$

where p is the external pressure driving the resonator.

Dividing throughout by and writing $Sx = u$ where u is the volume displacement, we have:

$$\frac{\rho}{c_0}\frac{d^2u}{dt^2} + \frac{\rho\omega K}{2\pi}\frac{du}{dt} + \frac{\rho C^2 u}{V_L} = p.$$

If p is a simple harmonic function of time of the form

$$p = p_0 e^{i\omega t}$$

this equation is similar to the electrical equation

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E_0 e^{i\omega t}$$

given in Part 1, and hence has the same type of solution with

1. $\dot{u}$ (equivalent to the electric current)
$$= \frac{p}{\frac{\rho\omega K}{2\pi} + i\left(\frac{\omega}{c_0} - \frac{\rho C^2}{V_L\omega}\right)}$$
= rate of volume displacement
2. The impedance $Z = Z_1 + Z_2$
$$= \frac{\rho\omega K}{2\pi} + i\left(\frac{\rho\omega}{c_0} - \frac{\rho C^2}{V_L\omega}\right)$$
3. $\frac{\rho\omega K}{2\pi}$ = acoustic resistance of the resonator
4. ρ/c_0 = acoustic reactance or intertance of the resonator.
5. $-\frac{\rho C^2}{V_L}$ = acoustic capacitance of the resonator.

It is convenient to write $M = \frac{\rho}{c_0}$ for the reactance and $\frac{1}{c} = \frac{\rho C^2}{V_L}$ for the capacitance.

Acoustic Elements: The Orifice

In discussing the Helmholtz Resonator, we have already considered the vibrating mass in an orifice. If the length of the channel is ρ and its radius a, then the mass of the fluid in the channel is $\rho\pi a^2 l$. However, it can be shown by advanced methods of analysis involving potential theory that this is not the entire vibrating mass, and that an addition has to be made to allow just for the presence of the orifice in the amount of $\frac{\rho(\pi a^2)^2}{2a}$

The entire mass affected is then

$$\rho\pi a^2 L + \rho\frac{(\pi a^2)^2}{2a}$$

In the equation of motion mass has to be divided by S^2 so that the effective mass becomes

$$\frac{\rho\frac{(\pi a^2)^2}{2a} + \rho\pi a^2 L}{(\pi a^2)^2} = \frac{\rho L}{\pi a^2} + \frac{\rho}{2a}$$

If c_0 is the conductivity of the orifice and channel as a whole then

$$\frac{\rho}{c_0} = \frac{\rho L}{\pi a^2} + \frac{\rho}{2a}$$

and

$$c_0 = \frac{1}{\frac{L}{\pi a^2} + \frac{1}{2a}} = \frac{\pi a^2}{L + \frac{\pi a}{2}}$$

Low Frequency Filter

We are now in a position to discuss a low frequency acoustic filter analogous to the low frequency electrical filter. The electric filter consisted of a pure inductance in the main line and a capacity in the shunt circuit. The acoustic low frequency filter as shown in figure 3, is constructed with an inner tube which is the main air conduit, partitions at intervals, an outer tube forming a chamber between partitions and a number of small orifices leading into the outer chamber. The orifices and the outer chamber between partitions constitute a Helmholtz Resonator with inertance and capacitance in series.

If the sections between partitions in the main conduit are short compared with the wave length, the air in such sections may be considered as vibrating as a whole (the phase difference between points close together is neglected in other words), and therefore constitutes an inertance.

The inertance of each line section is

$$M_1 = \frac{\text{(mass of air in tube per section)}}{S_1^2} = \frac{\rho_0 L_1}{S_1}$$

where L_1 is the length of one section.

The inertance of the branch, being a Helmholtz Resonator, is

$$M_2 = \rho/c_0$$

where

$$c_0 = \frac{\pi a^2}{L + \pi a/2}$$

and

a = radius of orifice
L = length of orifice

The capacitance of the Helmholtz chamber is

$$\frac{1}{c_2} = \frac{\rho C^2}{V_2}$$

where
V_2 = volume of the surrounding chamber
So that

$$c_2 = \frac{V_2}{\rho C^2}$$

We then have
$Z_1 = i\omega M_1$ for the main line and

$$Z_2 = i\left[\omega M_2 - \frac{i}{\omega c_2}\right]$$

for the shunt or branch.

We now have to set up arguments analogous to the arguments for the electrical circuit, remembering that excess pressure p is analogous to the E.M.F. of the electrical circuit and rate of volume displacement $\dot{u}$ is analogous to the electric current T and that the analogy between electric and acoustic circuits may be regarded as complete as far as mathematical calculations are considered.

We then have

$$\frac{Z_1}{Z_2} = \frac{i\omega M_1}{i\left(\omega M_2 - \frac{1}{\omega c_2}\right)}$$

In considering the low pass electric filter, we saw that the limits of frequency, between which there was no attenuation,

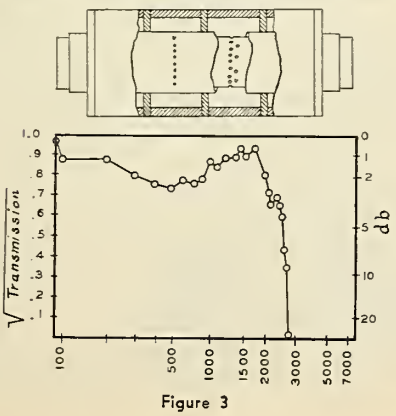


Figure 3

were given by the two equations

$$\frac{Z_1}{Z_2} = 0 \text{ and } \frac{Z_1}{Z_2} = -4$$

Putting

$$\frac{Z_1}{Z_2} = 0 = \frac{i\omega M_1}{i\left(\omega M_2 - \frac{1}{\omega c_2}\right)} =$$

$$\frac{\omega^2 M_1 c_2}{\omega^2 M_2 c_2 - 1} \text{ we find } \omega_1 = n_1 = 0.$$

Putting

$$\frac{Z_1}{Z_2} = -4 = \frac{\omega^2 M_1 c_2}{\omega^2 M_2 c_2 - 1} \text{ we have}$$

$$\omega_2 = \sqrt{\frac{4}{c_2 (M_1 + 4 M_2)}}$$

and

$$n_2 = \frac{1}{2\pi}\sqrt{\frac{4}{c_2 (M_1 + 4 M_2)}}$$

In figure 3[1] there are shown besides the filter itself, the region of non-attenuation up to a frequency of some 3000, and the region of complete attenuation for a typical low frequency filter.

High Frequency Filter

The high frequency filter is illustrated in figure 4. This consists of orifices or orifice and short tubes in the side of the main conduit. Here the branches possess inertance only, so that $Z_2 = i\omega M_2$. Where M_2 is calculated as shown previously for the orifices or orifice and short tube $= \frac{\rho_o}{c_o}$, where c_o is the conductivity of the orifice and short open tube calculated in the manner already shown.

A theoretical difficulty is involved in considering the line itself. The orifices which compose the branch lines are very short and consequently the pressure gradient in them is much greater than that in the line. Hence the particle velocity in M_2 is much greater than that in the line. It is as if the particles in the line were at rest relatively to those in the orifices, so that the line acts as a Helmholtz chamber with reference to the branch. It is therefore possible to consider the line as made up of inertance and capacitance in parallel.

In such a case

$$\frac{1}{Z_1} = \frac{1}{iM_1\omega} + \frac{1}{\frac{1}{i\omega c_1}} = \frac{1}{iM_1\omega} + i\omega c_1$$

$$= \frac{1 - M_1\omega^2 c_1}{iM_1\omega}$$

and $$Z_1 = i\left(\frac{M_1\omega}{1 - M_1 c_1 \omega^2}\right)$$

so that $$Z_1/Z_2 = \frac{M_1\omega}{M_2 (1 - M_1 c_1 \omega^2)}$$

[1]See Stewart and Lindsay's Acoustics.

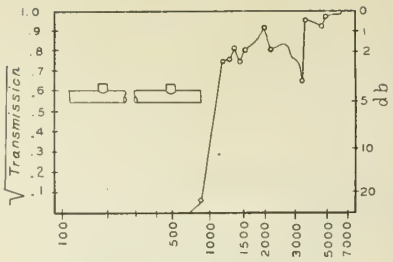


Figure 4. High frequency filter results

while $$M_1 = \frac{\rho l_2}{S} = \text{Mass}$$

$$M_2 = \frac{\rho_o}{c_o}$$

and

$$c_1 = \frac{V_1}{\rho_o C^2}$$

where V_1 = volume of one section of the line.

Putting

$$Z_1/Z_2 = 0 = \frac{M_1\omega}{M_2 (1 - M_1 c_1 \omega^2)}$$

One limit of non-attenuation will be $\omega_1 = \infty = n_1$

Putting

$$Z_1/Z_2 = -4 = \frac{M_1\omega}{M_2 (1 - M_1 c_1 \omega^2)}$$

We get a quadratic equation from which ω_2 and hence the lower limit of frequency n_2 can be found.

In figure 4 the experimental results for a typical high frequency filter are shown. Complete attenuation up to a frequency of about 750 cycles was obtained.

Application in Aircraft

There seems to be no reason why acoustic filters of this type should not be considered for application in aircraft. They are simple, easily constructed and experimental variation should be readily accomplished. The present article is only an introduction. Many problems must be solved and much information obtained before a successful application can be secured.

1. For a particular airplane, propeller and engine combination, it is desirable to know what frequencies predominate and from such general acoustical experience as is available, to decide what particular frequencies should be attenuated.

2. For a particular airplane, the size of the main conduit must be determined from general consideration of the ventilation requirements. It remains to be seen whether the introduction of the filter reduces the volume of air passing through a conduit for a given scoop. No information is available on this point.

3. If scoops or wing leading edge orifices are to be increased, in order to overcome the possibly greater resistance to motion of the air of a ventilating system provided with filters, then some consideration must be given to the greater aerodynamic drag involved.

4. The question arises whether the same type of acoustic filter is required at outlet as at inlet, or whether at outlet merely a larger impedance to entering sound is sufficient.

5. In the case of the high pass filter, the theory is not too well founded and experiments in confirmation seem desirable. Even though viscosity of the air is neglected, sound filters conform to theoretical calculations, nevertheless "cut and try" methods will be necessary. Methods of experimental filter design must be developed in which number and size of orifices and sizes of resonator chambers can be readily varied.

6. Consideration must be given to the combination of high pass and low pass filters and on their effects when used in series on one line.

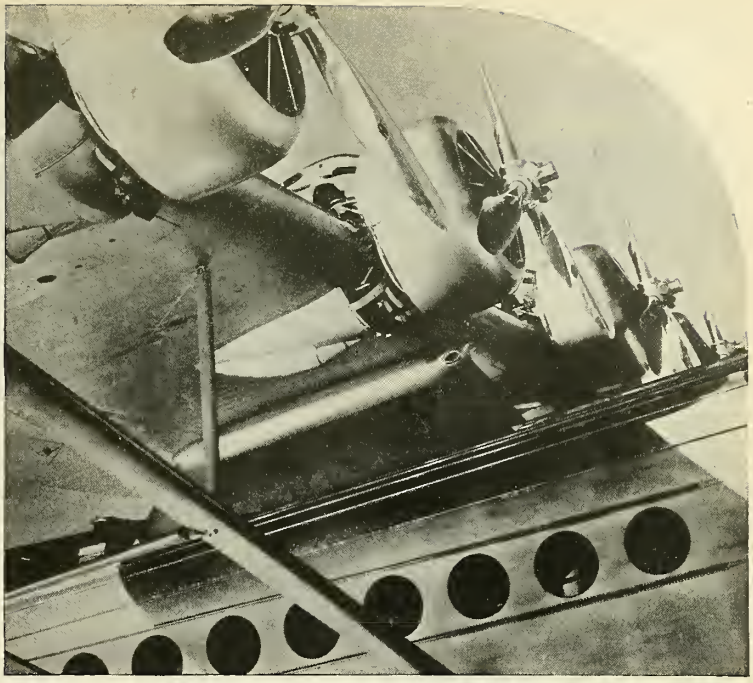
7. In the high pass filter, which is probably of the greater interest to the airplane builder one difficulty arises. The side branch or orifice must be open to the atmosphere. Will such a side branch or orifice in itself admit sound and hence defeat the purpose of the filter? Of course there should be little difference in sound level between the outside and the inside of the filter, and the open branch should offer considerable resistance to entering sound. Also the high pass filter might be constructed with a surrounding chamber disproportionately large so as to give the equivalent of the atmosphere; or with orifices opening into the baggage compartment where leakage of noise through the orifices would be of no importance. Again theoretical study might be devoted to the use of long side tubes with closed ends.

8. Finally the use of sound filters, properly so-called, must be weighed in comparison with sound dissipating systems where labyrinths and acoustic resistances actually destroy the intensity of the sound.

Applied to Mufflers

It may be of interest to add that filtration of sound for noise reduction purposes may well be applied to the exhaust mufflers. Mufflers frequently depend on baffles, passage through plates with small holes, conversion of energy into swinging motion, etc. In all such methods we have virtually the conversion of kinetic pressure into static pressure. As a result the muffling is obtained at the expense of some back pressure and loss of engine power. If sound filtration methods are applied then we may expect muffling of noise without the production of back pressure. Experiments along these lines have recently been made in Germany and tests have fully confirmed this view.

SKF EQUIPPED
BUILT BY
PRATT &
WHITNEY
AIRCRAFT CO.



RECORD FLIGHT PROVES VALUE OF SKF

▼ ▼ ▼ PERFORMANCE

DEPENDABILITY rides in the clouds as the SKF-equipped S-42 Sikorsky Super-Clipper opens a new era in air transportation . . . a development in which an outstanding part is played by SKF Roller Bearings for crankshaft and SKF Ball Bearings for propeller thrust . . . super-charger . . . valve rocker-arm and other vital rotating points of these four Pratt & Whitney Hornet Engines which are made for *safe* performance.

There are no service stations along the air lanes. Bearings *must* be dependable... especially when a plane carries 16,000 POUNDS AT 181 MILES AN HOUR. And the same SKF Bearings used by Col. Lindbergh in his "We" plane are in this Sikorsky, built from specifications drawn by Lindbergh. Men whose lives *depend* upon smooth performance invariably *select* SKF Bearings. Performance is the only thing that counts!

3237

● *You may buy a bearing as a bargain but try and get a bargain out of using it, for nothing is apt to cost so much as a bearing that cost so little*

SKF INDUSTRIES, INC., FRONT ST. and ERIE AVE., PHILADELPHIA, PA.

SKF
Ball and Roller Bearings

The Avro Commodore

Newest British Biplane for the Private Flier

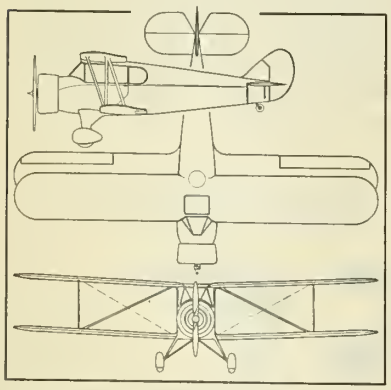
Photo courtesy of "Flight"

● The Avro Type 641, or "Commodore," cabin biplane, is designed to carry four or five occupants and enough fuel and oil for 4½ hours' flying at a cruising speed of 110 miles an hour. Intended primarily for private ownership rather than for commercial operation, the first of these ships was flown from the manufacturers' airport at Manchester to London. Details of internal furnishing were studied in the light of the best automobile practice and comfortable seating is provided for four occupants, with an "occasional" seat for a fifth; there is also ample room for suitcases and other luggage. The cabin is equipped with controllable heating and ventilating apparatus, and cabin windows are arranged to slide vertically. Smoking is permissible because the fuel tanks are located in the upper wing panels clear of the cabin.

The pilot's visibility is excellent in all essential directions.

Constructionally the "Commodore" is built (according to standard Avro practice) of welded steel tubes, with wooden fairings and the usual linen fabric coverings. Power is supplied by a Siddeley "Lynx" 215 h.p. air-cooled radial engine, equipped with a ring cowl.

The wings are heavily staggered and are made entirely of metal except for the wooden fairings of the tanks and the linen outer covering. The spars are steel and the ribs are aluminum. Mass-balanced Frise ailerons are fitted to the lower wings only. The interplane bracing of streamlined steel tube, consists of a pair of *N* struts and a cross-strut, which is in compression during normal flight, on either side of the fuselage.



Outlines of the Avro Type 641

Construction of the Body

The body is built of round section steel tubes with welded joints.

A good streamlined form is given to the fuselage frame by use of wooden fairings, to which are affixed the doped linen coverings. The forward part of the body, from a point aft of the fireproof bulkhead behind the engine to a little aft of the main planes, is occupied by the cabin, which has a total capacity of 104 cubic feet; its dimensions are 6 ft. 6 in. by 3 ft. 6 in. by 4 ft. 6 in.

The Siddeley "Lynx" seven-cylinder engine, which develops 215 h.p. at 1,900 r.p.m., is carried on a steel tube engine mount welded to the fuselage framework. Behind it is a fireproof bulkhead.

The outer sections of the airfoil ring cowling, covering the whole of the engine can be quickly removed to provide access to the cylinder heads and the valve rocker gear. Fuel is fed to the engine by gravity from two 50-gallon welded aluminum tanks, located one in each of the upper wings. The 6-gallon oil tank, similarly constructed, is in front of the fireproof bulkhead. A Siddeley electric starter, operated from an accumulator (charged by an engine-driven generator) can be fitted if required. The standard machine has a wooden propeller.

The single-strut landing gear is of a new type developed by the Avro company. It has oleo shock-absorbers, with steel springs in compression to take taxying loads. Dunlop medium pressure air wheels are equipped with brakes which can be applied on both wheels simultaneously, or on either wheel independently, for ground handling. The whole of the undercarriage structure is streamlined, with fairings over the struts and wheel pants over the wheels. The tail wheel has its own shock absorber and can swivel freely, though a centralizing device is fitted.

The tail unit is made of steel tubing, with doped linen coverings. The stabilizer can be altered during flight by a handle in the cabin which operates a screwjack at the tail. The rudder (but not the elevators) is mass-balanced.

The aileron controls in the lower main plane are made up of a combination of tie-rods in the straight sections and heavy weight cables at the wing tips where the run of the control changes direction to connect with the aileron levers. These cables pass round large-diameter pulleys mounted on ball bearings. Elevator control is positive while an auxiliary bar, located under the cabin floor and connected to the actuating pedals by tie-rods, controls movements of the rudder, to which it is joined by flexible steel cables.

Specifications

Wing span	37 feet 4 inches
Height overall	10 feet
Length overall	27 feet 3 inches
Wing chord	4 feet 9 inches
Gap	5 feet 3 inches
Dihedral angle	2.5°
Angle of incidence	3.25°

Areas (square feet)

Main planes with ailerons	307.0
Ailerons, total	31.5
Tail planes with elevators	39.6
Rudder	12.0
Fin	3.3
Wing loading	10.82 lbs. per sq. ft.
Power loading	15.45 lbs. per h.p.

Weights (pounds)

Weight empty	2,225
Useful load	1,275
Gross weight	3,500

Performance (with full load)

Top speed at sea level	130 miles per hour
Top speed at 5,000 feet	124 miles per hour
Top speed at 10,000 feet	115 miles per hour
Landing speed	50 miles per hour
Cruising speed at 1,000 ft.	110 miles per hour
Range at cruising speed	4.5 hours
Rate of climb at sea level	700 ft. per minute
Time of climb to 1,000 feet	1.60 minutes
Time of climb to 5,000 feet	9.50 minutes
Time of climb to 10,000 feet	28 minutes
Service ceiling	11,500 feet

THIS YEAR MORE PILOTS ARE DISCOVERING "THE WATER'S FINE"

BUSINESS

For instance—consider Manhattan's first "Airport." It's on the water!

Wide-awake operators and dealers are rapidly learning the advantages of bringing the airport —as well as the airplane—direct to the public. A case in point is the modern seaplane base and flying service now being operated by Sky Harbor, Inc., in New York City at 155th Street and Riverside Drive—the neighborhood of one of Manhattan's largest residential sections. Here, a few steps from city streets, New Yorkers can step aboard, fly safely over the water and enjoy a thrilling close-up view of the island city. Small wonder that Sky Harbor's Edo-equipped seaplanes are constantly in use for charter and instruction flights. Enterprising operators in other waterfront cities are already mapping plans to locate ramps or floats in central locations where the safety, pleasure and convenience of water flying are readily demonstrated to the airminded public. Write for details.

Seaplane base of Sky Harbor, Inc., complete with storage hangar and repair facilities, on the Hudson River, Riverside Drive, New York City.

(Photo copyright by Jack Zieff)

Mr. Johnsan and his fishing companian take their landing places as they find them. The collapsible rowboat was carried lashed to the seaplane floats.

EDO

PLEASURE

The supremacy of the seaplane for sport flying is strikingly demonstrated by this "Flying Fisherman"

In his Edo-equipped Waco seaplane, H. F. Johnson, Jr., of Johnson's Wax fame, penetrated deep into the forests of Central Ontario on a flying fishing expedition. Countless lakes offered a variety of convenient landing places —and a record-breaking catch, including 25-lb. muskies and 7-lb. speckled trout. A collapsible boat, carried strapped to the floats, proved a staunch craft for the fishermen, who also cast direct from the decks of the seaplane's floats. "We had covered in days" reported Mr. Johnson, "fishing country that could normally only be visited in many weeks." Equip *your* plane with Edo floats—fly direct to your favorite vacation spot—glide to a halt on Nature's landing fields—the ever-present waterways.

Write for information of standard sizes of Edo floats interchangeable with wheel landing gear. Address EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, New York.

★ EDO ★

FLOATS

Ryan Model S-T Two-place Sport Plane

● T. Claude Ryan's latest two-place sport plane, the S-T, passed its initial flight tests at Lindbergh Field, San Diego, California, on June 8th, with John Fornanero at the controls. Department of Commerce approval was received two weeks later.

The new development of the Ryan Aeronautical Co., with its all-metal fuselage and 142-mile-per-hour speed developed with a 95 h.p. engine, is the result of years of experience and, in the immediate past, concentrated effort of a complete organization for practically a year. In addition to rugged construction, the airplane embodies features which it is believed are most desired today by the sportsman pilot or commercial operator; namely, high performance, minimum maintenance, low operating costs and streamline appearance.

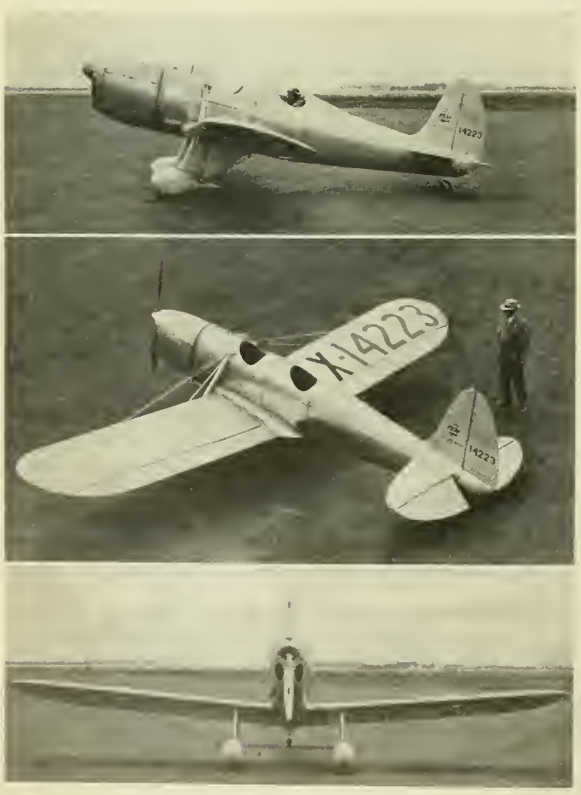
The plane is an open cockpit, low-wing type, principally of metal construction. Optional engine equipment includes the 95 h.p. Menasco B4 or the 125 h.p. Menasco C4 air-cooled, in-line, inverted four-cylinder engines. Fuel consumption with the Menasco B4 is at the rate of approximately 20 miles to the gallon.

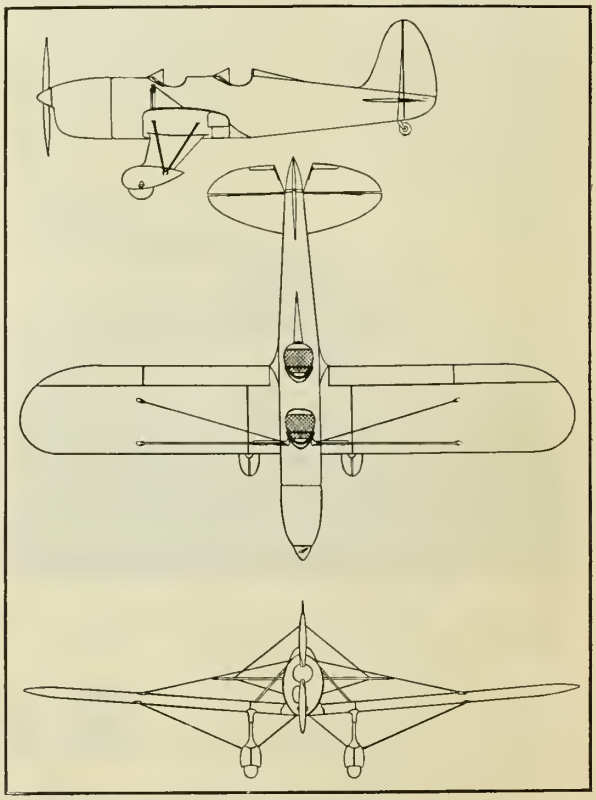
The fuselage is metal monocoque built entirely of aluminum alloy 17 ST and 17 ST alclad skin. Its cross section is elliptical, giving roomy cockpits and good vision, providing the pilot with visibility straight down and in the most desired angles. A sliding type convertible enclosure for the cockpit can be supplied as optional equipment. Luggage is carried in a compartment located between the cockpits. The steel tube engine mount is supported on rubber mountings at the fuselage. The engine is also carried on large rubber mountings on the bearers with resultant damping of vibration at all speeds. The stub wings are of steel tubing construction and are removable.

Wings of high aspect ratio are braced with streamline tie rods and spars are of solid spruce. All other structure is of metal. Ribs are stamped from aluminum alloy 17 ST sheet with flanged lightening holes. The nose section of the wing from entering edge to the rear of the front spar is covered with 17 ST sheet metal, while wing and control surfaces are fabric covered. Ailerons are of metal structure operated by a torque tube to the control stick; they are of the modified Friese type with differential action.

Wing flaps or air brakes extending over half the wing span are operated by a small crank which gives positive control. Tests have proven that the flaps decrease the landing speed by 8 miles an hour, permit a steep angle of approach and increase the ease and accuracy of landing, thereby making it possible to utilize smaller fields with safety.

The landing gear is of the racing type, incorporating long throw vertical oleo shock absorbers and full Goodyear airwheels and brakes. Landing stresses are distributed to the fuselage by a pair of inclined struts between the wing panels and the body. The wheels and gear are completely faired with the pants so arranged that the wheels can be removed quickly without disturbing the streamlining. The tail wheel has an 8-inch pneumatic full swiveling streamline tire with caster action through 360°.





Photographs and outline drawings showing side, top and front views of the Menasco-powered Ryan S-T Sport Monoplane

Tail surfaces are constructed of all-metal 17 ST alloy with stamped ribs riveted to tubular spars.

Tabs on the trailing edge of the elevators provide for longitudinal trimming. These are easily controllable with fine adjustment from either cockpit. No load is carried on the operating cable.

Dual controls are provided with the front cockpit controls quickly removable.

It is believed that with a different propeller the high speed can be increased and experiments are now being conducted toward this end. Following final flight tests for the Department of Commerce the company announced plans to go ahead immediately to manufacture the S-T on a moderate scale.

Specifications

Wing span	30 feet
Length overall	21 feet 5 inches
Wing chord	56 inches
Wing area (including ailerons)	124 sq.ft.
Height	6 feet 11 inches
Weight empty	1022 pounds
Useful load	528 pounds
Gross weight	1550 pounds

Performance with Full Load

Engine	Menasco B4	Menasco C4
Horsepower	95 h.p.	125 h.p.
High speed	142 m.p.h.	152 m.p.h.
Cruising speed	122 m.p.h.	131 m.p.h.
Rate of climb	808 ft/min.	1220 ft./min.
Service ceiling	16500 feet	19450 feet
Absolute ceiling	17650 feet	21200 feet
Landing speed	38 m.p.h.	38 m.p.h.
Gas capacity	24 gallons	24 gallons
Cruising range	403 miles	370 miles

Digest of Technical Articles from Foreign Publications

Wind Tunnel Interference

Wind Tunnel Interference on Wings, Bodies and Airscrews, H. Gloubert. (British) Aeronautical Research Committee—Reports and Memoranda No. 1566, *September* 13, 1933. (*Published May,* 1934) 75 *pages,* 34 *figs.*

A COMPREHENSIVE survey of wind tunnel interference on wings, bodies and propellers which shows that the limited extent of the airflow of a closed type or open jet wind tunnel is invariably constrained and interferes with the behaviour of the model tested. This interference could be minimized by using small models, but for many reasons the model should be as large as possible.

In a closed tunnel, the rigid walls hinder free lateral expansion of the airstream so that the velocity of the flow past a large body is increased, thereby intensifying the forces experienced by the body. If in testing a buff body or propeller there is a wake of reduced or increased velocity behind the body, the velocity and pressure of the stream surrounding the wake will differ from the undisturbed values far in front of the body. This pressure change causes a change in the force experienced by the body, somewhat different, however, from that experienced by a lifting body such as a wing. Wing lift is associated with a general downward movement of the air behind the wing and the constant of the tunnel walls on the downwash modifies the behaviour and aerodynamic characteristics of the wing.

Another type of interference is evident if there is a gradient of static pressure down the wind tunnel airstream caused by the development of the frictional boundary layer of reduced velocity along the walls of the tunnel. This leads to a velocity increase and pressure decrease along the tunnel's axis, so that a body being tested is in a slightly divergent airstream and experiences an increase in drag because of a drop in static pressure from nose to tail.

The basis of the theoretical treatment of the subject is examined and the method of analyzing particular problems is explained. Experimental results are quoted to justify the theoretical formulas or to derive empirical values to complete the theoretical analysis. The results required for the practical application of the corrected formulas are given.

Aerodynamics

The Lift on a Flat Plate Placed in a Stream Between Two Parallel Walls and Some Allied Problems, Susumu Tomotika. (Japan) Aeronautical Research Institute, Imperial University, Tokyo. Report 101. (*Published January* 1934).

IN THE first part of the paper the author discusses the steady irrotational continuous flow of an incompressible perfect fluid past a flat plate placed in a stream between two parallel plane walls, and calculates the lifting force acting on the plate by the Blasius formula.

To see how boundary walls exert influence upon lift, numerical calculations were made for the lift in a case in which the mid-point of the plate lies on the center line of the channel. The result shows that the lift on the plate in the channel is generally greater than the lift which the same plate would experience when placed in an unbounded stream, showing that the lift on the plate is always increased due to the boundary walls of the channel.

Two limiting cases, when either of the boundary walls of the channel removes to infinity, were next investigated. By removing the upper wall to infinity, the flow past a flat plate placed in the vicinity of a plane wall bounding the fluid on the lower side of the plate was obtained.

Periscope Sextant Test

Accurate High Altitude Observation by the Use of the Periscope Sextant (Genauigkeit von Hohenbeobachtungen mit dem Periskopsextanten). G. Forstner. (German) Deutsche Versuchsanstalt ful Luftfahrt. Report 349.

CONTINUING EARLIER experiments with bubble sextants conducted by the D.V.L., a periscope sextant was tested for suitability as a sextant. The instrument consists of an upper part in a streamlined casing which projects above the fuselage and a lower part projecting into the cabin, enabling the observer to work in a sheltered location. The instrument includes a compass and a level acting as an artificial horizon, also a cross-level as an aid towards maintaining the instrument in a vertical position, with adjustment considerably increased by a device incorporating a Wollaston prism.

In the course of the tests, measurements of the altitude of the sun were conducted on the ground and from an airplane. Comparison of the observed values with the computed actual altitudes gives the true observation errors which are subjected to critical examination in the report.

Effects of Lightning

Concerning the Danger of Lightning to Aircraft (Uber die Gefahrdung von Luftfahrzeugen durch Blitzschlage). W. Brintzinger and H. Viehamann. (German) Deutsche Versuchsanstalt fur Luftfahrt. Report 363.

DRAWING ON the information yielded by some recent reports of cases of damage to aircraft by lightning, the authors analyze the possible effects of lightning on aircraft, and the means for prevention of damage. In the investigation of such means conducted by the D.V.L., it was found that the best results for a lightning conductor (intended to be fitted in front of the aerial lead-in duct) were obtained with varioionised air gaps. The efficiency of the device is shown by measurements made with the cathode ray oscillography developed by the D.V.L.

Viscosity of Liquids

The Relation Between the Temperature Coefficient of Viscosity and the Association of High-molecular Liquids, Bunnosuke Yamaguchi. (Japan) Aeronautical Research Institute, Imperial University, Tokyo. Report 102. (*Published February,* 1934).

MEASUREMENTS WERE made of the viscosities of benzine solutions of various high-molecular liquids. By Staudinger's equation, which expresses the relation between the viscosity and the concentration of solution, a quantity which is called viscosity association was calculated for a number of high-molecular liquids. A simple relationship exists between the temperature coefficient of viscosity and the viscosity association of high-molecular liquids, and a reasonable conclusion is deduced concerning the relation between the temperature coefficient of viscosity and the molecular structure of high-molecular liquids.

Wind Tunnel

The N. P. L. Open Jet Wind Tunnel, A. R. Collar (British) Aeronautical Research Committee —Reports and Memoranda 1569, October, 1933. (Published April, 1934.) 17 pp., 10 figs.

THE REPORT deals mainly with preliminary experiments on models, which were carried out to insure that the projected tunnels should give the best possible aerodynamic performance.

In the design finally reached, the tunnel is of the open jet type with an elliptical nozzle, of which the major axis is horizontal; it has two return ducts, one passing above and one below the jet. At each of the right-angle corners of the ducts there is a cascade of guide vanes. Immediately before reaching the open working section of the tunnel the air passes through a contracting channel, which has a square section at the larger end and an elliptical one at the jet, the ratio of the areas being 3.9:1. After passing across the open working section, the air is received in a collector channel of approximately conical form, whose section varies from elliptical to circular. The propeller is four-bladed, and is situated at the enlarged circular end of the collector cone. To neutralize the rotation which would be imparted to the air by the propeller, radial blades of aerofoil section are provided.

The power factor of the model was subject to a large scale effect; at the jet speed mainly used during the experimental work, namely, 50 ft./sec., the power factor was 1.8. The variation with Reynolds number indicated that a full-scale power factor of about 2.6 might be expected.

A full-scale tunnel has been completed and the distribution of velocity in the jet is as good as those of most other tunnels of this type. The power factor has the predicted value of 2.6. The elliptical nozzle of the tunnel has a horizontal major axis measuring 9 ft. 1¼ in. and a minor axis of 7 ft., and an input of 375 b.h.p. at the propeller, yields an air speed of about 210 ft./sec. in the jet.

Wood Assemblies

Wood Assemblies, M. Monnin, (French) Technical and Scientific Publication of the Air Ministry. Aeronautical Research Service. Vol. 1.

A STUDY of the various types of joints used for timber structure. It includes a review of the mechanical and physical properties of timber, the effects of humidity, methods of stabilizing the properties of timber (varnishes), the problems connected with gluing and assemblies by bolts and rivets either in attachments of wood to wood or wood to metal. With regard to bolted joints, stress is laid on the importance of correct spacing and arrangement of the bolts, also of the relative length of the latter. In all assemblies the elongation of the parts of a joint should always be sought for unequal elongations arrest the proper distribution of the stresses and are the most common cause of fractures in fittings.

From this study the author concludes that, with a rational scheme of testing, timber, if properly worked, glued, varnished, assembled with balanced strengths, is superior to any other material—for equal weight of the parts—as regards strength values, ease in use, durability and reliability.

Fahlin SF-1 Cabin Monoplane

● A two-place, side-by-side cabin plane recently was completed in the Nicholas-Beazley Airplane Company's plant, Marshall, Mo., by Ole Fahlin (manufacturer of the Marshall-Fahlin propeller) and Swen Swanson, aircraft engineer and designer. Nicholas-Beazley is American distributor for the British-built Pobjoy engine which powers the job.

Featuring high performance, low operating costs and light weight combined with rugged construction, the plane will be sold by its manufacturers only on special order.

Powered by the 80-horsepower Pobjoy Type R engine, a top speed of 133 miles an hour and a cruising speed of 105 miles an hour, are attained. The landing speed is 40 miles an hour, service ceiling 19,000 feet and rate of climb 1450 feet per minute.

Wings of the new plane are of all-wood construction, full cantilever, gull-wing type, with complete weight, including ailerons, covering, dope and finish being 1 pound per square foot. The interior is fully upholstered with velour and the plane is finished throughout with Sherwin-Williams finish.

Twenty-two gallons of gas are carried in tanks provided in the wings, giving ample supply for 5½ hours of cruising, fuel consumption being at the rate of 4 gallons an hour. Provision also is made for 2½ gallons of oil.

Steps at the rear of the landing gear struts provide easy access to the exceptionally wide doors of the cabin. The landing gear is of the axle-less type with a tread of 5 feet 8 inches, with struts completely enclosed in a streamlined casing, faired into the fuselage, and braced by streamline tie-rods. Pneumatic-tired wheels and tail wheel are used.

The Pobjoy engine is of the geared type with a ratio of approximately 2:1, developing its rated power output at 1550 r.p.m. At normal r.p.m. of 1350, a horsepower rating of 75 is attained. The engine is enclosed in a full cowling which fits neatly into the clean streamlined effect of the body and which, with the gull-wing arrangement, provides ample visibility from the cabin. Details of the 1934 types of Pobjoy engines were given in the May issue of Aero Digest.

A new-type starter is operated from the pilots' cockpit; similar to the starter used on outboard motor boats, it is of the cable and ratchet type, weighing 3 pounds.

Specifications

Wing span	28 feet
Length	21 feet 10 inches
Height	7 feet 4 inches
Wing chord	7.5 feet to 4.5 feet
Power, Pobjoy R	80 horsepower
Fuel capacity	22 gallons
Oil capacity	2.5 gallons

Weights (pounds)

Weight, empty	690
Useful load	500
Gross weight	1190
Wing loading	8 lbs. per square foot
Power loading	15 lbs. per horsepower

Areas (square feet)

Wings	144
Stabilizer and elevators	24
Rudder and fin	10

Performance

Top speed	133 miles per hour
Cruising speed	105 miles per hour
Landing speed	40 miles per hour
Landing run	180 feet
Service ceiling	19,000 feet
Rate of climb	1450 feet per minute
Cruising range	575 miles
Gasoline consumption	4 gallons per hour

Fahlin monoplane with 80 h.p. geared type Pobjoy engine

Portable Utility Sprays

• PORTABLE ALL-PURPOSE sprays are being marketed by the Earl Webber Co., Chicago, Ill.

Designed for a multiplicity of uses, these completely portable sprays are loaded by an ordinary air chuck and can be taken anywhere. Constructed of heavy cold-rolled steel, they feature non-blow-out bottoms, corrosion proof lead lined tanks, solid brass fittings, and are riveted and soldered throughout.

Built to withstand 500 lbs. pressure per square foot, the sprays will, by interchangeable non-drip nozzles, provide both mist and needle spray. Positive control is provided by a pistol trigger, easy grip handle.

The complete line is comprised of a special windshield spray, two general utility sprays and one combination spray which is adapted to handling lacquer as well as oil or solvents.

Cold-Weather Starter

• A PORTABLE aircraft engine starting unit, found useful and applicable as an aid in cold-weather operations, has been designed for use on the new twin-engined Douglas transports in service over the TWA, Inc., transcontinental route.

The Douglas planes are equipped with an outside electrical connection for plugging in a cable which carries power to turn over the 750-horsepower Wright Cyclones used. A storage battery on a portable two-wheeled cart and a cable with a plug are utilized. A mechanic inserts the plug in a receptacle under the fuselage and turns on the switch located near the handle of the cart. The pilot then starts the engines without draining the battery-supply of the plane. The entire operation is done quickly and effectively.

Several TWA bases have installed this system following successful tests and trials of the unit.

Portable truck with starter apparatus

Air Gun For Graphite

• AMONG THE most recent developments in modern lubrication practice is the new Graph Air-Gun which enables Microfyne Flake Graphite, a lubricating powder, to be utilized for all-purpose lubricating service.

The air gun, being made of rubber, when squeezed deposits the graphite where needed in amounts controlled by the position of the nozzle in relation to a dial on top of the gun. A plug fitted to the bottom of the gun carries a chamois disc for use as a burnisher.

Microfyne graphite used by itself provides oilless, greaseless, temperature-proof, combustion-proof, dripless, odorless lubrication on metal, wood, rubber, leather, paper, fibre, composition, varnish, lacquered or painted surfaces, and is also used as a co-lubricant with oil or grease, being blown into oil holes, on oiled or greased surfaces or mixed with plain oil or grease before applying.

Graphite functions as an additional lubricating agent, making the lubricant as a whole more rugged and durable, saving much in lubricant and labor otherwise necessary in more frequent replacements, gives added protection to operating parts and reduces power waste. In aircraft, the manufacturers recommend its use for engines, exposed rocker arms, brake linings, fuselage bushings, undercarriage bearings.

Joseph Dixon Crucible Co., Jersey City, N. J., are producers of the gun and graphite.

Low Temperature Brazing Alloy

• A DEVELOPMENT in brazing and welding work has followed the introduction by Handy & Harman, New York, N. Y., of Sil-Fos, a low melting point brazing alloy in which silver is an important ingredient. The joints it makes are reported to be actually stronger than the metals themselves. This alloy flows freely from 300° to 800° lower than other brazing and welding rods, and is extremely fluid, penetrating deeply into the metals to be joined. The joints resist shock and continued vibration and have been used on battleships, locomotives, airplanes, automobiles and electrical and refrigerating equipment.

This alloy containing silver resists corrosion as well as the brass or copper with which it is commonly used.

Fire-Safe Aviation Fuel

• A FUEL which acts like water in actually extinguishing a blaze—which will burn only when and where it is supposed to burn, that is, in an engine or burner—which will not catch fire by accident under ordinary conditions—these are the most striking characteristics of Safe-T-Esso, the hydrogenated safety fuel now being produced by the Standard Oil Company of New Jersey. The explanation lies in the fact that in developing this "fire-safe" fuel the flashpoint has been raised successfully to above 110° F.

The flashpoint of a fuel is the temperature at which the vapor given off will ignite upon the introduction of a spark or flame. Fire insurance restrictions are based on the experience accumulated in handling and dispensing kerosene since it came into use many years ago. This, with more recent and extensive experience with special naphthas, indicates that if the flashpoint of a fuel be above 105° F. or thereabouts, the danger from accidental ignition of spillage or leakage is negligible, and the danger from formation of explosive mixtures with air in storage or working quarters is minimized. The flashpoint of kerosene is about 105° F., and this point is now recognized as the dividing line between hazardous and safe liquid fuels for handling at normal indoor and outdoor temperatures. The new safety fuel has been certified by the Underwriters' Laboratories as being in the same fire hazard category as kerosene.

The use of Safe-T-Esso should reduce, if not eliminate, the fire hazard in an airplane crash, where instantaneous explosion of the gasoline tanks usually results in total destruction. A striking illustration of the low fire hazard of this fuel was given when incendiary bullets fired through a tank partly filled with the fuel did not ignite, either when the bullets passed through the fuel or through the space above it in the tank.

The flashpoint of ordinary motor gasoline commercially available today varies from about minus 40° F. to minus 80° F. This means that a flammable or explosive vapor is given off at every temperature likely to be encountered in the use or storage of the fuel. Although motor gasoline is rightly classified as a hazardous fuel, the conditions under which it is used in automobiles reduce the hazard to a very low statistical figure, and consequently there has been no great demand for improvement. In the field of marine and air transportation, however, where enormous advances have been made in gasoline engine design, the fire and explosion hazard is of vital importance.

There are two means of solving the

problem of reducing this hazard—first, through a different type of power plant, such as the oil-burning Diesel engine, and second, through the development of a "fire-safe" high-flash fuel suitable for use in the modern gasoline engine, particularly the highly refined engines designed for speed boats and aircraft. The first has been followed with some degree of success, and real progress has been made in developing light-weight high-speed Diesel engines in the marine field. The alternative solution, worked out by Standard Oil technicians in the development of Safe-T-Esso, offers advantages since it is adapted for use in modern gasoline engines.

The requisites of such a fuel are sufficient volatility to permit complete vaporization prior to ignition at charge temperatures not substantially different from those experienced with normal gasoline, and an octane number equal to that of the best anti-knock gasoline. The first requirement is met without difficulty by close fractionation, the lower limit of boiling point being fixed by the flash requirement and the upper limit by the volatility requirement.

Until the development of the hydrogenation refining process, the octane number requirement defied practical solution, for the anti-knock value of both natural and cracked products in the required boiling range is far below that required by the modern automotive engine. Even the use of ethyl fluid in permissible quantities was not sufficient to overcome the detonation tendency of the high-flash fuels heretofore tested, a stumbling block upon which previous attempts to employ safety fuels came to grief. In the study of products from hydrogenation, however, it was found that the octane numbers of the various fractions, instead of lowering progressively with increase of boiling points, could by proper choice of charging stock and operating technique be held constant, or even raised in the case of fractions in the range of safety fuels. This characteristic solved the problem. The octane number of Safe-T-Esso, as shown by the C. F. R. Motor Method, is 88, without the addition of any anti-detonant. When tested in the C. F. R. engine equipped with a Bosch fuel pump and injected into the cylinder, an octane number of 95 was indicated for Safe-T-Esso when matched against pure octane and heptane, all other conditions being identical with those prescribed for the C. F. R. motor method.

The extremely high octane number of this fuel demonstrates its suitability for use at compression ratios much higher than those in common use in the most efficient present-day, high-duty automotive engines, and several engine manufacturers are investigating the possible gain in efficiency attendant upon increasing compression ratios to a point where the inherently high octane value of the fuel is fully realized.

Due to its low volatility, the use of Safe-T-Esso will involve in most instances special provision for easy starting. The ordinary carburetor, although in theory an atomizing device, in practice does not carry atomization to the point where the mixture is capable of air flotation. Therefore the fuel, which does not evaporate with sufficient rapidity at ordinary temperatures, either fails to reach the cylinder at all, or reaches it in a liquid form, when an attempt is made to start the engine by cranking.

A comprehensive series of tests conducted on widely varying types of engines, ranging from high duty radial and V-type aircraft engines, through those of conventional automotive type, and including several types of large marine engines, indicates that Safe-T-Esso is adapted to use in solid injection equipment installed on otherwise normal spark ignition engines. In those engines adapted to the solid injection apparatus, either of the direct cylinder injection type or in manifold injection systems, results comparable to those obtained by the use of high octane aviation gasoline have been obtained.

Pioneer Electric Tachometer

• THE ELECTRIC tachometer manufactured by the Pioneer Instrument Co., Brooklyn, N. Y., consists of two units—a two-phase, three-wire, alternating current generator and an indicator of the induction disc type, operating on the watt meter principle. This is an entirely new application of this principle and has overcome many difficulties experienced with other types of revolution indicators.

This instrument embraces many substantial features which contribute to the furtherance of airplane engine efficiency and convenient installation. No moving coils, slip rings, commutators or sliding contacts are used and there is but one moving assembly in the entire instrument. This assembly consists of a thin metal disc which is mounted on the same staff with the indicator pointer, a method of construction which substantially precludes the possibility of operating errors and materially increases the instrument's efficiency and stamina.

An outstanding and advantageous feature of this indicator lies in the fact that it employs alternating current and the pointer may be adapted to make from one to three revolutions for the range of 0-3000 r.p.m., giving an extremely open scale which provides precise r.p.m. readings for any working range from idling speed to full throttle.

Another feature incorporated is the fact that it is the first watt meter type instrument to be successfully compensated for temperature changes. This feature was

Pioneer electric tachometer Type 840

accomplished only after several years of experimentation which allowed the introduction of compensating features which insure accurate indication in temperatures from 60° below C. to 45° above C.

The photograph shows type 840 Indicator (two-revolution), typical of the many instruments supplied the U. S. Army and Navy Air Services. These instruments have been subjected to the most rigid military vibration and service tests and have been accepted as standard equipment for many military planes.

Generator and indicator of the Pioneer electric tachometer unit are interchangeable, so that it is not necessary to match the indicator with a special generator, and any Pioneer indicator may be substituted at any time with any Pioneer generator. In former types it was necessary to calibrate the indicator with the generator and leads with which it was to be used.

These features of the Pioneer Electric Tachometer are individual to this particular instrument. In addition, the usual advantages of tachometer installation are also incorporated. The instrument lends itself to installation on large airplanes where the motor is a great distance from the dashboard. Tachometer shafting is eliminated entirely. Installation is simplified because the wiring may be permanently concealed.

The tachometer, because of its rugged and substantial construction, will withstand the most severe vibration, and no shock absorbers or special mounting is required to protect it.

The Pioneer Synchronizer, a development for multimotored planes, consists of three small lamps mounted in a case and wired between the two tachometer generators. When both motors are in synchronism, the lights are out. Should one motor vary from the other as much as 1 r.p.m., the lamps will start flickering in the direction toward the motor which is out of synchronism. This installation is only applicable in connection with Pioneer alternating current generators.

Romance ahead

Cradled high on the deck of the S.S."Ile de France" a luxuriously appointed Douglas Amphibion is on its way to serve—as no other airplane in the world can serve—the pleasures and business demands of a famous Frenchman, M. Armand Esders.

To choose a Douglas Amphibion is to choose the utmost in personal transportation—a decision that is becoming traditional among the great yachtsmen of the air . . . and whose ranks soon will be swelled by such Commodores as William K. Vanderbilt, Alfred G. Vanderbilt and Philip K. Wrigley. Douglas Aircraft Company, Inc., Santa Monica, California.

DOUGLAS *Amphibion*

CUSTOM FINISHED . COMPLETELY SOUND INSULATED . TWIN ENGINES . EVERY PROVEN AIRLINE SAFETY DEVICE

Anti-Friction Bearings in Aircraft

D. E. BATESOLE

Assistant Engineering Manager, Norma-Hoffmann Bearings Corporation

Recent developments in the design and construction of aircraft have resulted in a marked increase in the use of ball and roller bearings. Transport ships have required ball bearings at almost every moving part of the controls, in order to reduce friction at bearing points and increase the ease of handling. For long distance and high-speed flights many new types of equipment have been developed, including controllable pitch propellers, retractable landing gears and special instruments such as the automatic pilot, all of which involve the mounting of some kind of ball or roller bearings. Including the engine and its accessories, it is not unusual to find at least 100 anti-friction bearings in the modern ship. In multi-motor transports, this total, including those used in the instruments and controls, may be in excess of 300. The necessity for compactness, light weight and dependability has made it necessary in many instances to design entirely new types of bearings, and this article describes some of these new designs, and, by means of typical mounting illustrations, shows the manner in which they are used.

● Several articles have been written on the subject of bearings for airplane engines, particularly since the engine at one time constituted the largest field for anti-friction bearings in the aircraft industry. With the advent of larger and heavier ships flying at higher speeds, the need for smooth and free-turning bearings at the controls has resulted in an ever increasing use of ball bearings, and often a greater number of bearings are used in the controls than in the power plant with all its accessories.

Briefly the advantages of ball bearings for controls may be enumerated as follows:

1. Less attention is required for inspection, greasing or oiling.
2. Fewer repairs and replacements are needed.
3. Controls are more easily operated.
4. Controls will not jam or "freeze."

Ball bearings in control systems are commonly applied to hinges, pulleys, bell cranks, push and pull rod guides and clevis joints, stick mechanisms, steering wheels and sprockets, rudder and brake pedal bars and stabilizer adjustment mechanisms. For many of these applications, ball bearings of special design, with maximum static load capacity and with built-in protective seals of pressed metal or felt, are used.

The illustration in figure 1 shows a typical hinge application. The bearing is of the double felt seal type making it unnecessary to provide any additional protection against dust, moisture or other foreign matter. The outer surfaces of the bearing are cadmium plated to resist corrosion and before the bearing is assembled it is packed with a protective grease sufficient to last for the life of the ship. This grease which neither oxidizes, dries up or hardens at low temperatures, ensures a bearing that will turn freely when the ship is flying at high altitudes. The outer ring of the bearing is mounted with a tight interference fit in the hinge but the inner ring should have a slip fit over the stationary pin.

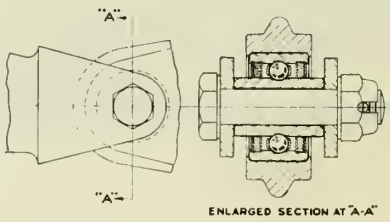


Figure 1. Typical hinge application

Another completely enclosed ball bearing is that shown in the control pulley in figure 2. Instead of felt being used for protection, pressed metal side plates are employed. These plates, which are usually of non-corrosive material or cadmium plated, have a close clearance over the recessed inner ring, so that a "labyrinth" form of protection is provided. In order to obtain the maximum static load-carrying capacity, pulley bearings are usually made with a full row of balls and with a raceway contour closely conforming to the curvature of the balls. The bearings are held to a close internal clearance to reduce the "wobble" of the pulley and so prevent fouling of the supporting yoke. A large chamfer or radius on the outer ring permits "staking" or "peening" the brass insert of the pulley over the edge of the bearing to give rigid endwise holding.

Figure 3 illustrates an arrangement of shielded ball bearings used to guide a push-pull tube. The bearing in this instance has a special concave surface on the outer ring conforming to the contour of the tube, a guiding arrangement desirable where long sections of tubing are used. Bearings are protected by double side shields and are packed with grease before the side plates are applied, so that no further lubrication attention is required.

Another new design of ball bearing is that illustrated by figure 4, which shows the end of the bell crank connected to a section of control tubing. On account of the difficulty of assuring accurate alignment of parts, a self-aligning type of bearing is necessary. In this instance, however, it has been possible to apply protective side shields to the

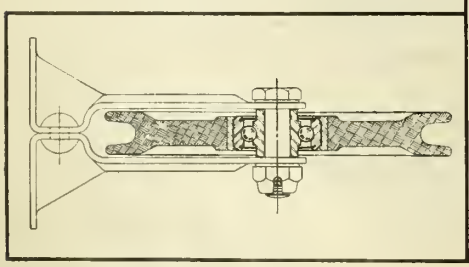


Figure 2. Completely enclosed bearing

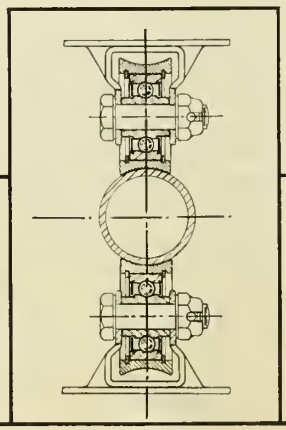


Figure 3. Tube guides

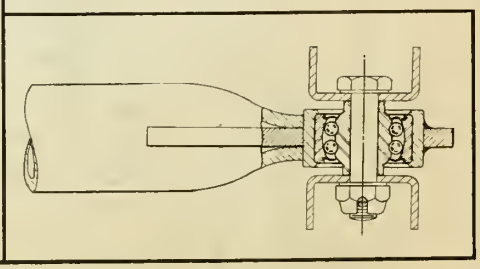


Figure 4. End of belt crank control

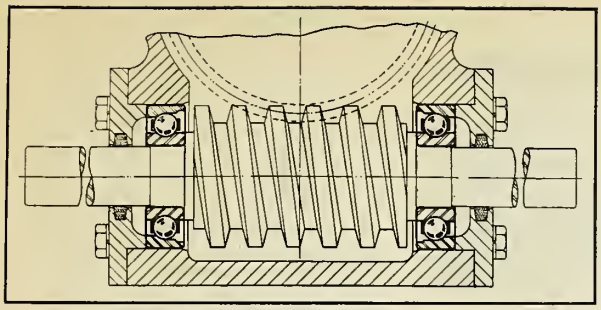


Figure 6. Stabilizer adjustment worm shaft

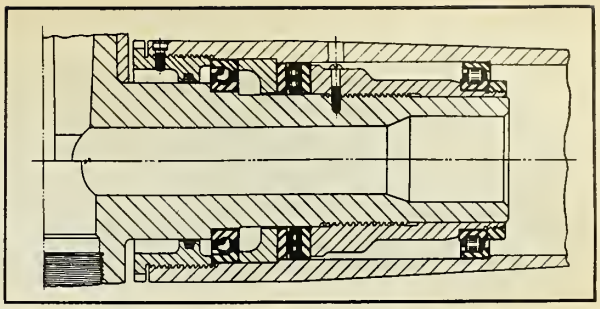


Figure 7. Controllable pitch propeller hub mount

bearing. By using curved surfaces at the outer portion of the bearing inner ring, the side shields cannot strike the ring, regardless of its position. In order to allow for approximately 10° of misalignment without contact between balls and side shields, the outer ring is somewhat extended. Likewise, the inner ring projects at each side to allow the maximum misalignment to take place without fouling the bearing support. The bearing has a high static load capacity made possible through the use of two full rows of balls.

In figure 5 another recent design is shown at the end of a worm used in connection with a retractable landing gear mechanism. The bearing is of the angular contact type but is capable of carrying heavy thrust load in either direction, in addition to radial load; for this reason it is referred to as a duplex bearing. The outer ring is made in two halves clamped together. Through the use of this two-piece outer ring, heavy thrust capacity is obtainable in a bearing of relatively narrow width and light weight. This bearing is designed for use where the thrust load to be carried is greater than the radial load.

The illustration in figure 6 is that of a stabilizer adjustment worm shaft. Open- or separable-type ball bearings are mounted at each end of the worm, to simultaneously carry thrust and radial load. The bearings are used in opposed positions with no threads or lock nuts employed. The inner rings are pressed on the worm shaft and the outer rings in the housing, after which the final assembly is easily made. The unit is partially packed with grease of light consistency.

Several new types of bearings are shown in the controllable pitch propeller hub mounting in figure 7. On account of the limited space available and the heavy loads involved, standard types of

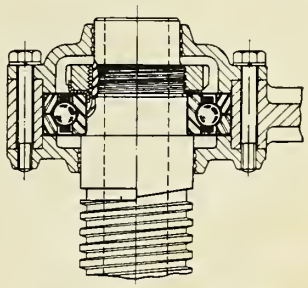


Figure 5. Landing gear worm

bearings are usually inadequate for propeller mountings and accordingly the builder must resort to special bearing designs. In this mounting the thrust load (which is extremely heavy at high propeller speed) is carried on a roller thrust bearing with several rows of relatively short rollers. The retainer, or cage for the rollers, is designed to ride upon the outer thrust bearing plate so that the centrifugal load due to the weight of the retainer will not be exerted on the rollers.

The radial load in the propeller hub is sustained by the open-side ball bearing at the inner position and by an extra light type "one-lipped" roller bearing at the outer position; both bearings being spaced well apart. Outward thrust of the propeller cannot be exerted against the ball bearing, but when properly adjusted, the ball bearing will carry the location thrust in the opposite direction. All of the three bearings shown are designed for compactness, light weight and maximum static load capacity.

Another new type of bearing recently used in aircraft applications is the so-called "needle" roller bearing. It has the advantages of heavy radial carrying capacity and resistance to overload and shock. Needle rollers have a length ranging from five to ten times their diameter and are used without a retainer. If desired, more than one row of rollers may be employed to obtain the necessary load carrying capacity.

Figure 8 shows a typical mounting of needle rollers in an autogiro pivot. In this illustration three rows of needle rollers are used with hardened and ground steel spacers separating each row. The compactness of the design is evident and it has been found that an extremely heavy load may be carried with such an arrangement. Grease is inserted directly into the space between the rows of rollers to provide lubrication. The parts forming the inner and outer raceways of the bearings are hardened and accurately ground to form smooth contact surfaces. Needle roller bearings are also being used in many aircraft engine applications, particularly for supercharger and propeller reduction gear drives, and, in a few instances, for connecting rod mountings.

The types of bearings shown here have been designed to carry relatively heavy loads in comparison to their size and weight. In the field of aircraft instruments, however, we find different requirements—extreme sensitivity, and in some cases, ability to rotate continuously

(*Continued on page 56*)

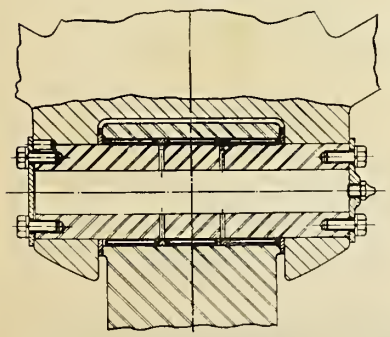


Figure 8. Autogiro needle rollers

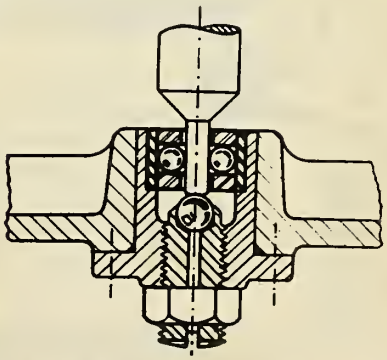


Figure 9. Typical instrument bearing

DeLuxe Model 90 Monocoupe

● Consistent with general design features of the Monocoupe line, but improved in performance and appearance, the new DeLuxe Model 90 Monocoupe has passed its tests as a feature of the Monocoupe line for 1934. Powered with the new Lambert R-266 90-horsepower engine, the DeLuxe 90 attains a top speed of 140 miles per hour and a normal cruising speed of 120 miles per hour.

Outstanding design features are the installation of flaps in the trailing edge of the wing; tunnel cowling, which reduces head resistance, facilitates engine cooling, and increases visibility and increased cabin and door width. Wing flaps are raised or lowered quickly and effectively by an independent push-pull type control.

New streamlining features, especially in the outboard strut connections and in the undercarriage, contribute to increased performance.

Redesigned stream shielding, together with the new tunnel cowling, provides increased visibility from all angles, and a new manually-controlled ventilating system has been installed to keep the cabin at a comfortable temperature during all seasons. The pilot's seat is further forward of the rear wing spar, providing more head room than before. The instrument panel carries the usual engine and flight instruments, but has been enlarged to accommodate equipment required for blind flying. Controls are of the usual dual stick type, with the working parts of the control system easily available for inspection by dropping a large metal cowling which covers the underportion of the fuselage.

Performance of the DeLuxe Model 90 is increased by the use of the new Lambert R-266 and the incorporation of the wing flaps. Economy of operation is evidenced by the fact that the plane will fly 120 miles an hour with a fuel consumption of only 5 gallons, which is at the rate of 24 miles to the gallon of gas.

With the flaps operating, take-off with full load is accomplished in 10 seconds or in 328 feet; landing with brakes is completed in 100 feet. Without using the brakes, a landing can be made in 162 feet. Without flaps, take-off requires 12 seconds or 428 feet; landing without brakes or flaps requires 400 feet.

The landing gear, utilizing a rubber shock cord, has a tread of 5 ft. 3 in., and is equipped with 6.50 × 10 Aircraft Products semi air-wheels and brakes by the same company.

The 90 h.p. Lambert R-266 has several new constructional features. A new two-piece magnesium alloy crankcase, split on a plane through the cylinder center, is machine finished as one piece, thus assuring correct bearing alignment. Cylinder heads and pistons, of the same heat-treated heat-resisting alloy, have been redesigned with rocker boxes cast with the head enclosing all valve gear.

Use of a short stroke of 3.75 inches provides high engine speed with low piston travel, allowing efficient use of a small diameter propeller. The two-piece, single throw type crankshaft is of heat-treated chrome nickel steel and is supported on three ball bearings.

Gearcase assembly is simple in construction and is removable as a unit with auxiliaries and drives assembled. The lubrication system is of the pressure dry sump type. The engine develops its maximum horsepower at 2375 r.p.m. and 85 h.p. at 2250 r.p.m. From records supplied by present owners of Lambert engines, an average of 400 hours is evidenced before overhaul.

Standard equipment includes wheel pants, tunnel cowling, wing flaps, parking brake, steel propeller, clock, magnetic compass, altimeter, airspeed indicator, tachometer, oil temperature and pressure gauges, 6.50 × 10 semi-air wheels and brakes, dual controls, fire extinguisher and first aid kit.

Specifications

Wing span	32 feet
Length overall	20 feet 6 inches
Wing area	132.3 square feet
Weight empty	935 pounds
Gross weight	1,585 pounds
Engine (Lambert R-266)	90 horsepower
Fuel consumption	5 gallons per hour
Top speed	140 miles per hour
Cruising speed	120 miles per hour

Test flights with full load reveal the following additional performances:

Take-off run (no flaps)	428 feet
Take-off time (no flaps)	12 seconds
Take-off run (flaps)	328 feet
Take-off time (flaps)	10 seconds
Landing run (no flaps or brakes)	400 feet
Landing run (flaps but no brakes)	162 feet
Landing run (flaps and brakes)	100 feet

Average Mail Bid Is 27.9 Cents

BIDS ON 12 new air mail routes received by the Post Office Department included surprisingly low offers to carry the mail. With the award of contracts for these routes, the country's air mail system will total 28,548 miles and negotiations for further bidding on mail routes will temporarily be brought to a close.

Three biddings were held on the new air mail set up, including those for which contracts already have been awarded and on which private operators are now flying the mails. The per mile average mail pay for the first bids received was 28.8 cents; for the second bidding it jumped to 38.5 cents, while the third and last bidding averaged 20.27 cents, bringing the average rate of pay for the sixty bids received to a general average of 27.9 cents. The maximum rate allowed is 45 cents.

In the last group bidding, the following routes and the companies submitting the lowest bids were:

Detroit-Milwaukee, Pennsylvania Airlines & Transport Co., 38.9 cents; Chicago-Fort Worth, American Airlines, Inc., 8 cents; Pueblo-El Paso, Varney Speed Lines, Inc., 24 cents; Washington-Chicago, American Airlines, Inc., 29 cents; Boston-Cleveland, American Airlines, Inc., 24.5 cents; Billings-Cheyenne, Wyoming Air Service, 28.5 cents; New Orleans-Houston, Robertson Airplane Service Co., 16.7 cents; Charleston-Fort Worth, Delta Air Corp., 24.8 cents; Cleveland-Nashville, American Airlines, Inc., 14⅞ cents; Newark-Fort Worth, American Airlines, Inc., 13 cents; St. Paul-Kansas City, Hanford Tri State Airlines, Inc., 18.9 cents, and Boston-Burlington, National Airways, Inc., 29.5 cents. A complete list of all cities embraced in these routes appeared in the June, 1934, issue of AERO DIGEST.

American Airlines began service over four of these routes on June 10 and on June 15 inaugurated service over a fifth route.

Additional contracts have already been awarded to National Airways, Inc., Delta Air Corp., Pennsylvania Airlines and Transport Corp., Wyoming Air Service and Varney Speed Lines. These companies have thirty days in which to inaugurate service over the routes for which they were the low bidder.

United Nearly Doubles Traffic

UNITED AIR Lines carried 9,035 revenue passengers in February contrasted with 4,949 the same month last year, and an increase of 595 over January of this year. Approximately one million miles were flown during the period and the company completed 92 per cent of all mileage scheduled.

Air express was 153 per cent greater than last February's volume, and 14 per cent over January. The company is making every effort to develop air express business, in cooperation with other lines which have the Air Express Division of the Railway Express Agency as the affiliate pickup-delivery system.

DOUGLAS TRANSPORT MAKES LONG NON-STOP FLIGHT

THE LATEST RECORD established by the Douglas transport now flying over the TWA routes, is that of the longest non-stop flight ever made by a passenger transport. The flight was between Los Angeles and Wichita, a distance of 1296 miles, during which a speed of 199.2 miles an hour was maintained.

Airline Schedules Increased

EIGHT ROUND-TRIPS each day are now being flown in Curtiss-Wright Condors between Washington and New York by Eastern Air Lines, Inc., following an increase in passenger and express service between the two cities.

With the new schedule, planes are now departing from Newark at 7:40, 8:40, and 11:40 a.m., and 1:40, 3:40 and 4:40 p.m. for Washington; at 5:40 for Miami and 9:40 for New Orleans, carrying passengers and express. The through schedules to southern points also carry air mail.

Eastern Air Flying 3,040 Airway Miles

EASTERN AIR Lines, Inc., began night air mail service over the Chicago-Jacksonville airway on June 1, following the award of a temporary mail contract. Air express will also be carried and plans for adding passenger service are being studied.

Inauguration of this service rounded out operations over all routes now included in the Eastern Air Line system. Previously the company started mail, passenger and express service between Atlanta and New Orleans, connecting in Atlanta with the New York-Atlanta route.

In addition to Chicago and Jacksonville, the new route serves Indianapolis, Louisville, Nashville, Chattanooga, Atlanta and Macon and connects with the New York-Miami route at Jacksonville; to the southwest and west at Atlanta and Nashville and with the north, northwest and northeast at Chicago.

Eastern Air Lines is now flying 10,628 scheduled miles daily over routes totaling 3,040 airway miles and serves 29 cities. The company is now in second place in the number of route miles and daily miles flown.

Air Mail Bill Passed

THE NEW air mail bill has been signed by President Franklin D. Roosevelt and a new rate structure both for air mail and air mail payments is to go into effect.

The law not only sets up limitations of contracts which the Postmaster General is authorized to let for one year, but also authorizes the appointment, by the President, of a committee of five to study the formulation of an aviation policy. It is not expected to have any effect on the temporary contracts now in force.

The law provides for competitive bidding, with awards going to the lowest responsible bidder tendering sufficient guarantee for faithful performance. A bidder disbarred by the Postmaster General may appeal to the Comptroller General, whose decision shall be final.

Base pay will not exceed 33.3 cents an airplane mile for loads not exceeding 300 pounds; for heavier loads, the pay will reach a maximum of 40 cents a mile.

The Interstate Commerce Commission is authorized, after notice and hearing, to alter rates on a fair basis, but not in excess of the established rates. Contracts satisfactorily performed during the initial and extended period shall be continued for an indefinite period in accordance with any changes in rates that may be made by the ICC, but any contract so continued may be terminated by the ICC upon sixty days' notice and after a hearing. The contractor may also cancel his contract on the same terms.

Prohibitions have been placed on holding companies and interlocking directorates and no person holding a contract may buy an interest, directly or indirectly, in any other aviation properties except landing fields, hangars and ground facilities. Salaries of executives are not to exceed $17,500 annually, and maximum and minimum flying hours for pilots and the speed, load and safety factors of aircraft are to be prescribed by the Secretary of Commerce.

The air mail postage, under the new bill, has been reduced to six cents an ounce or fraction thereof, effective July 1.

Airline Initiates New Service

EXTENSION OF its present service between Washington and Cleveland to Detroit was announced by officials of Pennsylvania Airlines, as the first 12-passenger Ford tri-motor plane left Washington Airport over the new route.

At present one round trip will be flown daily, making the run to Detroit in 4 hours 20 minutes, 1 hour 30 minutes faster than any other service now offered to the Great Lakes city. Direct connections will be made at Cleveland for Chicago and the west.

Airline Increases Schedules

EXTENSIONS OF its air transport service, the addition of new schedules on established routes and the use of new equipment on existing airlines, effective at once, were announced by Lester D. Seymour, president of American Airlines, Inc.

Springfield, Mass., is being served with a direct New York line, tri-motored planes flying two round-trips daily with stops at Hartford. Elmira, N. Y., was made a scheduled stop with an additional daily schedule between New York and Detroit, using Ford transports, and as soon as work on the Scranton, Pa., airport is completed, that city will be included in the schedule.

The 90-minute non-stop Boston-New York service, inaugurated last March, was increased from two to five round-trips daily with 15-passenger Curtiss-Condors used. Hartford is served by three daily schedules between New York and Hartford and one Boston-Hartford schedule in each direction.

Northwest Airlines Resumes Service

NORTHWEST AIRLINES, Inc., resumed service over the northern transcontinental route from Chicago to Seattle and is carrying mail, passengers and express between Fargo and Seattle. Only passengers and express are being carried between Fargo and Chicago.

Ford tri-motored equipment is operating between Billings and Seattle and the new 200-mile-an-hour Lockheed Orions between Billings and the Twin Cities. One schedule between the Twin Cities and Chicago is operating with the new Lockheed Electra which was recently delivered to the company. The second schedule between the Twin Cities and Chicago is flown with Orions. As soon as the full fleet of bi-motored Electras has been delivered, present plans provide for their being flown over the entire route from Chicago to Seattle.

31,415 Passengers Carried in April

SCHEDULED AIRLINES operating in the United States carried 31,415 passengers in April, 1934, according to reports to the Department of Commerce from 18 of the 19 companies operating during that month.

These scheduled airlines flew 2,450,692 miles, carried 150,383 pounds of express and flew 12,378,678 passenger miles during the month in question.

Comparison with February and March, 1934, show that an increase was recorded in the number of passengers carried, express poundage and in the number of passenger miles flown.

SLEEPER PLANE SERVICE OPERATING ON SCHEDULE

INAUGURAL SLEEPER plane service was initiated out of Dallas when an American Airlines' Condor took off for Los Angeles with passengers on the first regularly scheduled flight of sleeper planes. Accommodations are provided in spacious berths for 12 persons in these twin Cyclone-powered transports.

Hanford Extends Service

HANFORD TRI STATE Airlines, Sioux City, Ia., contract holder for air mail service between Chicago and St. Paul-Minneapolis and Fargo and Pembina, N. D., has extended its passenger service to Winnipeg, Canada. There has been no air travel service between the Twin Cities and Winnipeg since last February. Gene Shank, operations manager for Hanford, recently made the trip which opened the new service.

Air Mail System to Be Studied

A NATION-WIDE survey of the new air mail system for the purpose of affording air mail patrons the best possible service will be made during the next few months, according to the Post Office Department.

As the survey progresses, inspection tours and visits to the pivotal points in the system will be made by Harlee Branch, in charge of the air mail service and Stephen A. Cisler, general superintendent of the air and railway mail services.

The survey will include a check on performance records of the new contractors, on the volume of mail carried, the patronage given the offices supplied, and an investigation into the necessity of increased frequency of schedules on some lines to coordinate more closely the air and railway mail systems.

Another phase of the survey will be an effort on the part of the Post Office Department to familiarize the people with the great saving of time that can be accomplished by the use of the airplane to carry the mails.

April Air Express Sets Record

WITH NUMBER of shipments 22 per cent over March and topping April, 1933, by 188 per cent, the Air Express Division of Railway Express Agency reported another all-time record for the handling of cargoes over commercial airlines during April, 1934. This express matter was flown by contract aviation lines comprising a nation-wide network and includes United Air Lines, General Air Lines and others giving a coordinated transcontinental and feeder-line system. The number of shipments in the April increase totaled more than half the number handled during the entire year of 1932.

Another High-Speed Line Inaugurated

AIR PASSENGER schedules based on a cruising speed of 3 miles a minute have been inaugurated by TWA, Inc., with the Douglas airliner, operating between New York and Chicago. The airliner is capable of speeds exceeding 200 miles an hour with fourteen passengers, full crew and cargo, but the scheduled speed, excluding time spent in taxying at the airport, is kept at about 180 miles an hour, to provide ample reserve speed and power.

The first TWA Douglas put into regular airline service early this year after a period of two years spent in design, development and exhaustive tests, has already carried more than 5,000 passengers since it was delivered.

Alaskan Freight Line Opens

PTARMIGAN AIR LINES, headed by Frank Dorbandt, has been organized to operate a freight line between Cordova, Anchorage and Fairbanks, chief cities in Alaska.

Five planes capable of carrying from two to 10 tons each are being placed in service. Extensions of the line will take a route over the Bering Sea to Siberia.

Dorbandt is a pioneer flier and was one of the first pilots to carry the air mail in the North. At one time, he landed Father Hubbard, the flying priest, in the crater of the Aniakchak Volcano.

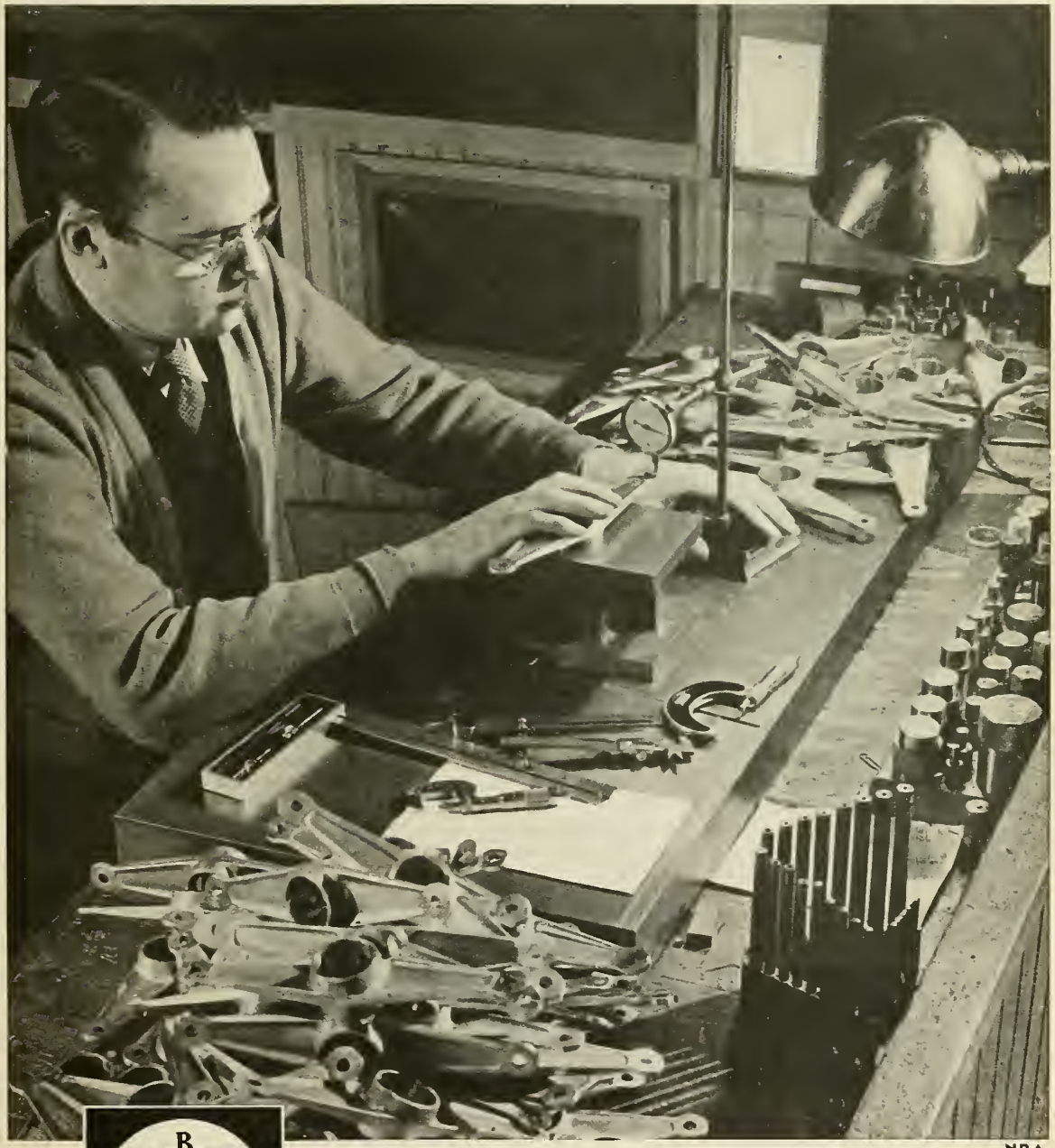
South Bend on Airline Route

THE BENDIX municipal airport at South Bend, Ind., became a regular stop for the transport planes of United Air Lines when regular service was instituted under the direction of Thomas Wolfe, Chicago traffic manager of the airline company.

(*Continued on following page*)

NOT JUST ONE FROM A PILE

• Every part from every pile comes under the scrutiny of Boeing inspectors! One hundred per cent inspection, rather than the representative kind, is the order with these hard-to-please experts of the aircraft plant. Boeing Airplane Company, Seattle, subsidiary of United Aircraft and Transport Corporation.



BOEING

• BOEING HAS ALWAYS BUILT •
TOMORROW'S AIRPLANES TODAY

(*Continued from preceding page*)

Traffic Personnel Added

ADDITIONS TO American Airways' New York City traffic personnel have been announced by Charles A. Rheinstrom, general traffic manager.

Pat O'Toole, formerly city traffic manager at Rochester, N. Y., has been transferred to the New York office to take charge of ticket agent contacts. J. M. Knappenberger, who preceded O'Toole at Rochester, will return there after serving in Buffalo.

George Swayne, previously city traffic manager at Hartford, Conn., also has been transferred to the New York office and Don Carson, city traffic manager at Springfield, Mass., will take his place in Hartford. In addition to the above, Rheinstrom announced the appointment of Glen Jury as city traffic manager in Louisville, Ky., succeeding Conger Poague, resigned.

Radio Transmitter Installed

A NEW, seven and a half watt airport radio transmitter which operates on a frequency of 278 kilocycles has been installed in the Department of Commerce airways' teletype station at Love Field, Dallas.

It is to assist airline and military fliers covering the Dallas-Kansas City route and is equipped for releasing radio signals which can be detected by pilots flying low over the field.

Express Poundage Increases

AMERICAN AIRWAYS express tonnage for February showed a gain of 174.63 per cent over the same month last year, marking the 14th consecutive month that an increase of 100 per cent or more over the comparable month of the preceding year has been recorded by the company.

During the month, the company's planes carried 37,897 pounds of express, comparing with 13,799 pounds in February, 1933, and 36,845 pounds in January, 1934.

Air Route Lighting Planned

THE NORTHWESTERN transcontinental air route from Minneapolis and St. Paul through Billings to Seattle probably will be lighted for night flying by this fall, according to L. L. Jilson, aeronautical development expert, Department of Commerce, Aeronautics Branch, who has been making the surveys.

Route Lighting Work Inaugurated

WORK ON completing the lighting of the Oklahoma City-St. Louis airway was started when the Public Works Administration agreed to back the project. All engineering and survey work on the route which is now lighted to Tulsa, was completed under a previous allotment.

The route connects at Oklahoma City with the Oklahoma City-Amarillo airway and at the latter point joins the transcontinental route.

TWA OPENS NEW YORK AIR TICKET OFFICE

INFORMATION AND reservations on airlines will be obtained at the newly opened TWA, Inc., air ticket office in the Grand Central zone of New York. The offices are directly opposite the Grand Central Terminal at 70 East 42nd Street. Airport limousines for TWA flights depart from the new city ticket office for Newark airport.

Short Line Extends Route

CHESAPEAKE AIR FERRIES, Inc., operating between Baltimore and Easton, Md., has expanded its service after an application filed for a permit to extend its franchise to include Cambridge and Salisbury, Md., was approved.

The newly inaugurated service provides a twice-daily schedule similar to the one now operating.

Frank Reemploys 30 People

REEMPLOYMENT OF approximately thirty persons for the air mail and passenger service between Salt Lake City and Great Falls, Montana, which recently resumed operations, was announced by Alfred Frank, former president of the National Parks Airways and now contractor in his own name. Mr. Frank recently returned from Washington, D. C., where he submitted his bid for the route at a slightly reduced figure than before the government canceled the contracts. The schedule on the Frank route has been cut from two round trips to one round trip per day.

Lighted Airway Projects Progress

A NEW Federally-lighted airway project has been finished, another is nearing completion, and bids for construction of a third have been advertised.

Rex Martin, Assistant Director of Aeronautics in charge of Air Navigation of the Commerce Department, ordered the beacon lights on the new airway between Louisville and Indianapolis, and between Omaha and Davenport turned on. He also has called for bids for construction of a new lighted airway between Galveston and Waco.

Division Headquarters Selected

OMAHA, NEB., has been selected as division headquarters for United Air Lines, with the operating area comprising 908 miles of connecting lines. Stations at Des Moines, Lincoln, Grand Island, North Platte, Iowa City, Moline and Kansas City are under this office. Ralph Reed will be superintendent and the mechanical force there will make motor and plane inspections.

Airline Service Expanded

ADDITION OF a new de luxe Condor schedule between New York and Chicago via Buffalo and Detroit due to increased patronage has been announced by Lester D. Seymour, president of American Airlines, Inc.

One afternoon plane now departs at one o'clock and a second plane leaves at four, arriving in Chicago seven hours later. Chicago departures are at 12:30 o'clock and 5 o'clock in the afternoon with arrivals at Newark at 7:29 and 11:59 o'clock respectively.

To provide a better span of service on the New York-Detroit schedule with stops at Elmira and Detroit, that plane leaves at 6 p. m.

Airline Moves Quarters

HEADQUARTERS of the Wyoming Air Service, Inc., which has the mail-carrying contracts between Cheyenne and Pueblo and Billings and Cheyenne, will be shifted from Casper, Wyo., to Denver, Colo., according to Dick Leferink, president. Plans have been completed for operation of the line over the routes and six new Stinson monoplanes have been purchased for use in the new venture. Marvin Landis is the traffic manager.

Braniff Flying Lockheeds With Mail

SIX WASP-POWERED Lockheeds went into service when Braniff Airways, Inc., inaugurated night mail service between Dallas and Chicago under a government contract.

Supplementing the night schedule, the company has installed a day passenger service between the same cities, via Fort Worth, Oklahoma City, Bartlesville, Tulsa and Kansas City. Current schedules call for an eight-hour flight, with ships leaving Dallas at noon and arriving in Chicago at 8:10. Southbound planes leave Chicago at noon and arrive in Dallas at 7:45.

United Offers Frequent Service

AIR COMMUTER service between New York and Chicago has been inaugurated by United Air Lines with Boeing twin-engined transport planes on hourly schedules.

Planes leave New York hourly on the hour for Cleveland and Chicago and depart from Chicago hourly on the half hour for the east during daylight hours. Schedules are less frequent during the evening.

Thirteen planes are being flown each way every 24 hours, providing fast service between the two cities. United has assigned 35 of the low-wing, high-speed Boeings to the eastern division of its mid-continent routes to provide the commuter service. Several of the schedules connect at Chicago with other United planes flying to Omaha, Salt Lake City, the Pacific Coast and Kansas City.

Glider Towed 150 Miles to Show

STANLEY SMITH of Ann Arbor, Mich., was towed 150 miles across country to South Bend, Ind., by Homer Stockert to be present at the first field exhibition of the newly organized Bendix Gliders' Club. The trip, made in the face of a strong head-wind, took three hours.

Over the Bendix Municipal Airport, Smith cut loose at 1200 feet and landed. Large crowds watched the subsequent exhibition of soaring, looping and other glider maneuvers.

Officials of the Bendix Glider Club at South Bend are Guy Weber, president; Clyde Brower, vice-president; Fred Windsor, treasurer and Francis Shedd, secretary.

20,000 See Ft. Wayne Air Show

A RYAN B5, equipped with a Wright engine and sponsored by the Fort Wayne *News Sentinel,* was piloted to victory in the 15-mile invitational race in that city by Capt. Clarence Cornish, manager of the Aereco Flying Service.

The race was part of an air show staged at the Paul Baer Municipal Airport and more than 20,000 persons witnessed the events, which included bomb dropping, parachute jumps, stunt flying and races.

Aero Club Incorporated

THE WING OVER Club of Beaumont was granted a Texas charter by the Secretary of State and entered into its third year of existence as an incorporated organization. The club maintains club rooms at the LaSalle Hotel in Beaumont and has a membership of 49, consisting entirely of licensed pilots with the exception of two honorary members.

Officers are: Larry J. Fisher, president; Burton Holton, vice-president; Mrs. Wier Merchant, secretary-treasurer; Frank Estill, Joseph Delaune, O. K. Hargraves, Albert L. Stuart and A. E. Wedgeworth, directors.

Study classes are maintained for student pilots and air events are promoted as is aviation and private flying generally. Meetings are held twice each month.

12 WOMEN PILOTS IN ANNETTE GIPSON RACE

THE THIRD Annual Annette Gipson All-Women's Air Race, held at Roosevelt Field June 24, included a field of 12 starters who flew a 30-mile closed course for a cash prize and the Annette Gipson Cup. The winner was Edna Gardner of Washington, D. C., who was followed by Suzanne Humphries and Frances H. Marselis, in that order. More than 7,500 persons witnessed the event.

Club Starts Membership Drive

A GOAL of 150 members has been set by the Dixie Aviation Club, Memphis, Tenn., which has launched a new drive for members under the direction of Robert Vaught, Thomas Adams and John Webb. An attendance prize, consisting of a flying course including solo time up to 10 hours is being offered. Regular meetings are being held at the Peabody Hotel weekly, according to Al Gardner, president.

Girls' Flying Club Meets

THE SOCIAL meeting of the Chicago Girls' Flying Club, held recently at the home of Miss Bee Gronde, was featured by an educational lecture by M. J. Rotunna of the Metropolitan News Photo, Chicago Municipal Airport, who illustrated his talk with moving and still pictures of aviation in its various stages of progression.

Crowd at Grand Central Air Terminal during Junior Birdmen air pageant

Junior Birdmen Pageant Draws Crowd

MORE THAN 25,000 persons witnessed the first Junior Birdmen Pageant at Grand Central Air Terminal, Glendale, Calif., and were entertained with a full program of sport and precision flying.

Among the performers were Lloyd Downs, Waldo Waterman, Ralph Bushey and Garland Lincoln. Frank Hawks, just back from China where he demonstrated a Curtiss-Wright bomber, Cliff Henderson, Dudley Steele and Major C. C. Mosely were also in attendance. The TWA Douglas airliner, Waterman's "Whatsit" and Bushey's speed plane were flown for the benefit of the crowd.

A demonstration of military flying by the Army Air Corps Reserves from Long Beach featured the events of the day.

Sportsmen Pilots Elect Officers

ROBERT B. HALL, sportsman pilot of Baltimore, Md., was reelected president of the Chesapeake Flying Club, Inc., of the same city for the fifth consecutive term to serve with Gwynn Lease, vice-president; Clarence H. Fisher, secretary; George Anderson, chairman membership committee and Gail F. King, operations manager.

The election of officers featured the fifth anniversary of the founding of the organization which is composed entirely of local sportsmen pilots who have flown more than 3,000 hours. There are eighteen members in the club which maintains headquarters at 1117 St. Paul Street, Baltimore.

Camber Club Holds Air Meet

THE SPRING air meet of the Camber Club, Baltimore, Md., organization of sportsmen pilots was held at the Curtiss-Wright Airport in that city. Eight events were on the program, including a bombing exhibition by members of the Twenty-ninth Division Aviation, Maryland National Guard.

Featured were a series of parachute jumps, topped by a triple jump, a handicap race with ten entries including three women and acrobatic flying.

Women's Air Meet Scheduled

A WOMEN'S national air meet is to be held at the Dayton Municipal Airport, Dayton, Ohio, August 4 and 5, 1934, sponsored jointly by the Women's National Aeronautic Association and the Ninety Nines.

Plans for the meet include as a main event, a closed course handicap race for cash prizes, and a number of other contests, such as spot landings, dead stick landings and balloon bursting. There will be other awards in addition to cash prizes, details of which will be announced later. Martha C. Smith, of Dayton is chairman of the executive committee.

Curtiss Summer Courses Approved

SUMMER COURSES for teachers at the Curtiss-Wright Technical Institute, situated at Grand Central Air Terminal, Glendale, Calif., which have the approval of the Vocational Division of the California State Board of Education for the past two years, have been approved in full by the Oregon State Board of Education and for special aeronautical subjects by the Board of Education at Washington, according to Major C. C. Mosely, in charge of Curtiss-Wright activities in Southern California.

This development promises to bring good-sized delegations from Washington and Oregon inasmuch as aeronautical study in schools is attracting more students each succeeding year.

Purdue Building Air Unit

A $50,000 hangar and aeronautical laboratory is under construction at Purdue University, Lafayette, Ind., on ground provided by David E. Ross, head of the Ross Gear factories and president of the Board of Trustees of the University.

A portion of the new structure is to be used for instruction and research work in aviation. In connection with the hangar there will be service rooms, weather and radio equipment laboratories and field offices. The new project is to be a practical tie-up of flying field activities of a commercial nature, and advanced student instruction in aviation research and engineering work. The field is to be lighted for night flying.

Warren School in Larger Quarters

THE WARREN SCHOOL of Aeronautics is now in its tenth year of operation and has taken new quarters at 236 W. 18 Street, Los Angeles, Calif, where it will continue to specialize in instruction for aviation mechanics and engineers.

Culminating ten years of progress, the school was forced to seek larger quarters and moved into a building in the trade school center of the coast city. The school is fully equipped for instruction, with the work being conducted by Charles A. Warren, president.

Bendix Ground School Opens

AN AVIATION ground school for factory and office employees of the Bendix Aviation Corp. has been established in South Bend, Ind., and regular weekly meetings are being held with more than 150 pupils in attendance.

Local aviators and aeronautical experts contribute their services as lecturers while the school is conducted under the direction of H. S. Cole, who is also director of the Bendix Service School. Textbooks used are the same as those at Wright Field, Dayton.

KLEMIN HONORED FOR AERONAUTICAL WORK

PROF. ALEXANDER KLEMIN, in charge of the Daniel Guggenheim School of Aeronautics, New York University, and technical editor of AERO DIGEST, received an honorary degree from Kenyon College, Gambier, Ohio, by virtue of service rendered in the field of aeronautical science. Kenyon College includes the Wilbur L. Cummings School of Practical Aeronautics and maintains Port Kenyon, a flying field situated near the campus.

School Executive Aids Airline

A LEAVE of absence from his duties as president of Safair Flying School and Service, Roosevelt Field, N. Y., has been taken by O. P. Hebert, who is now aiding in the organization and operation of Pacific Seaboard Airlines, Inc., which was awarded an air mail contract over the Chicago-New Orleans route. Carlton Putnam, president of the airline, learned to fly under Mr. Hebert's guidance.

The Safair School is supplying much of the operating personnel for the airline and a number of transport graduates have been appointed to positions at the seven bases between Lake Michigan and the Gulf, and at the main base in Memphis. Originally, Wright-powered Bellancas will be used to fly the route, but it is planned to add Lockheed Electras to the run when passenger traffic volume has been developed.

Offers Courses in Aviation

DAVENPORT AIRWAYS, Inc., Davenport, Ia., recently announced the opening of new classes in aeronautical ground courses. The entire course of fifteen weeks consists of classes four nights a week held at Cram Field. Subjects included are theory of flight, airplane mechanics, aircraft engines, navigation, meteorology and air regulations.

School's Equipment Augmented

EXPANDING ITS ground school equipment by the addition of more instructional apparatus, the Boeing School of Aeronautics, Oakland, Calif., now offers detailed visual instruction in power plant supercharging.

Instructors Herbert Marsh and E. J. Camy of the aircraft power plant shop have constructed a sectional assembly of the blower section of a Wasp engine. The assembly shows the arrangement of supercharger impeller, gear train, clutch drive and all various bearings, cylinders, collars and shafts in their proper location. The assembly complements a sectionalized Wasp motor cut away to show all internal working parts and the mechanical set-up of the engine.

Boston School Approved

DEPARTMENT OF Commerce approval of its ground and flying courses has been obtained by Inter City Flying and Ground School, Boston Municipal Airport, E. Boston, Mass. The school is under the direction of Charles W. Sutherland and the flight instructor is Lieut. F. P. Kendall.

Flying equipment consists of Kinner-powered Fleets for primary work; Monocoupes and Fairchild "22's" for secondary training and a Waco Cabin plane for advanced instruction. The company is New England sales representative for the two latter types. In addition, there is available a Curtiss Fledgling completely equipped with blind flying instruments and a Curtiss Robin.

The courses offered, both flying and ground, include transport, limited commercial, private and amateur. A complete mechanics course is also being offered by the organization.

Dawn Patrol Makes Air Tour

FOUR SHIPS from the Spartan School of Aeronautics, Tulsa, Okla., flown by members of the Dawn Patrol, accompanied the Oklahoma Air Tour on its flight covering the state. The tour required five days to complete and covered a distance of 1,400 miles. There were thirty-six ships on the tour flown by pilots from Oklahoma and several adjoining states. Airports were visited that had received aid from the CWA, many of which had planes landing for the first time when ships of the tour visited the field.

SPARTAN

MECHANICAL COURSES

COMPARE THESE PRICES

Room Rent FREE with any course during entire period of training. Part time work if desired.

Transport Pilot's Flight and Ground Course	$1,745.00
Limited Commercial Pilot's Flight and Ground Course (Includes Master Mechanic's Ground Course)	520.00
Private Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	375.00
Master Mechanic's Flight Course (15 Hours Flying)	300.00
Master Mechanic's Ground Course (5 Months)	225.00
Amateur Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	285.00
Regular Mechanic's Flight Course (15 Hours Flying)	225.00
Regular Mechanic's Ground Course (3 Months)	135.00

The ECONOMICAL School!

SPARTAN has invested over a MILLION DOLLARS in the most modern of aeronautical equipment, comprising fully equipped classroom shops, the Spartan Aircraft Factory and the Government Approved Repair Station No. 50, one of the highest rated in the country.

The student studying a Spartan Mechanical Course receives the full benefit of this tremendous investment in equipment and personnel. His instruction started in the primary work in completely equipped classroom shops, advances to study on actual production work in the fully equipped Spartan Factory. Here the student has the opportunity of actually building aircraft under full production methods, continuing his study on numerous types of ships in the Spartan Approved Repair Station.

In addition to the various flight courses offered, which include mechanical courses, the Regular and Master Mechanic's Flight Courses include fifteen hours of actual flight instruction.

Spartan offers complete courses to fit YOU for a definite place in Aviation to-morrow, and each is backed by a MILLION DOLLAR investment—write for a catalog describing the SPARTAN Courses offered by America's outstanding School of Aeronautics.

New-Type Runways at Kelly Field

BLACK AND white non-skid surfaced runways have been constructed at Kelly Field, San Antonio, Tex., to provide adequate night and day visibility and to enable pilots to more accurately estimate their distance above the field.

The striped effect was made using Colas, a black-colored emulsified asphalt, in the construction of all wearing surfaces on a new runway, the old warming-up line, taxiways and roadways at the field. As this product, manufactured by the Shell Petroleum Corp., will penetrate a compacted roadway surface and uniformly coat each particle with a film of asphalt, it was possible to leave it uncovered for the black stripes without danger of the surface becoming soft or sticky. For the white stripes, a layer of pea gravel was thoroughly rolled in immediately after application of Colas.

The idea was developed by Air Corps officers in cooperation with Shell's asphalt sales department representatives, who helped supervise the covering of 150,000 square yards.

The new runway extends 1,500 feet out from the old warming line in the direction of the prevailing winds. The old warming line has been widened to 200 feet and extended to 6,800 feet, giving an east-west runway when needed, and a warming line of appropriate and adequate dimensions.

Airport Reports 1933 Deficit

A DEFICIT of $9,382 in the operation of the Milwaukee County Airport for 1933 was shown in a recent report. Although the county received $19,532 in sales at the airport, at a profit of $11,346, operating expenses for the year were $20,766.

The number of planes arriving and departing decreased, but more passengers arrived and departed from the airport than during 1932. There were 6,787 arrivals, an increase of 1,021 and 6,505 departures, an increase of 1,099 passengers while airplanes arriving numbered 2,759, a decrease of 340 and departures were 2,734, down 344.

AIR SHOW TO FEATURE AIRPORT OPENING

LAWRENCE COUNTY'S (South Dakota) new airport, now nearing completion, will be dedicated July 22, with an air show sponsored by the Black Hills Aero Club. Col. R. D. Gerritt is expected to make the principal address.

The airport, located east of Spearfish, is designed to serve Lead, Deadwood, Spearfish and Whitewood.

Idaho Plans More Airports

THE CONSTRUCTION of landing fields in the state of Idaho has been advanced by at least ten years through the CWA program, in the opinion of A. C. Blomgren, director of aeronautics for the State Department of Public Works. G. E. McKelvey is commissioner of the department.

Thirty-two projects were constructed, only three remaining non-usable as a result of stoppage of CWA work. Further work, however, is contemplated on seven new fields through the cooperation of the Civilian Conservation Corps and the Transient Relief Corps while an additional six fields are planned under the regular Federal Employment Relief Association.

The state recently issued a state airport map which is extremely useful and well-prepared. Diagramatic sketches of the major fields and a map of the state showing all fields are included.

Three Southwest Airports Dedicated

AIRPORTS IN Arkansas and Oklahoma were officially dedicated recently, heralding the completion of more new projects in the fast-growing nation-wide chain of flying fields.

Under the auspices of the local American Legion Post, the Clarksville, Ark., airport was officially opened with an air meet and a crowd of 2,500. The Heavener, Okla., airport also had an air show as a feature of its opening, while the dedication of the Weddington Airport in Hugo, Okla., was the principal feature of the program given in connection with the State Chamber of Commerce's annual air tour.

New Government Field Operating

THE NEW Department of Commerce landing field at Seymour, Ind., on the Indianapolis-Louisville route, is now lighted for night flying and has reached a stage of completion which permits landings by day or night. The port is the half-way emergency landing field between Indianapolis and Louisville and has a revolving beacon, field border lights and runway indicators as well as obstruction lights.

It includes 110 acres leased by the government and is almost entirely level. There are three runways designated by lights at night and by crushed stone markers in the daytime.

Glasgow to Have Air Show

AN INVITATION has been extended by Glasgow, Mont., to aviators of the northwest to join in a gala celebration July 3 to 5 in commemoration of the completion and dedication of the local airport and the opening of an all-steel hangar. An air circus, featuring Tex Rankin, will be staged during the three days. In addition, the Glasgow airport committee is negotiating with the Army air service for a pursuit or observation squadron.

New striped runway system at the Army training base, Kelly Field, San Antonio, Texas

Idaho Airports Gaining

IDAHO AIRPORT facilities are being enlarged and improved with considerable progress made in the recent past.

At Preston, three runways, averaging 2000 feet each and completely surfaced with gravel topped with shale, and a metal-covered hangar 60 feet square, have been completed. The hangar includes an office, machine shops and dormitory and has concrete floors with all-metal roofing and sides. Plans are under way to pipe the city water system to the airport.

Graveling is under way on three 2500-foot runways at the Burley municipal airport which is well-lighted and newly improved while at Downey, a considerable sum of money is going into the construction of a new project.

Intermediate Field Under Construction

WORK IS now in progress on the new airport southwest of Fort Plain, N. Y., under the supervision of C. N. Wilson of the Aeronautics Branch, Department of Commerce. When completed the field will be designated an intermediate landing field and will be one of the largest of its kind in the state. Complete lighting equipment will be installed.

Airport Encourages Airmindedness

TWO FREE scholarships, offered by Somerton Airport, through the Northeast Philadelphia Chamber of Commerce to young men over 16 years of age, were awarded winners of a contest which consisted of writing an essay on "Aviation in Northeast Philadelphia." These scholarships entitle the winners to a complete ground school course.

Judges were Alvin A. Swenson, chairman of the Aviation Committee, Joseph B. Seaman, president, Northwest Philadelphia Chamber of Commerce and Chester S. Roberts, president of the Tacony Manufacturers Association.

Dallas Site Proposed for Port

OFFICIALS OF the Trinity River levee district, reclaimed bottom lands near the Dallas, Tex., business districts, are making overtures to city officials for providing another airport in this area, which is directly back of the local union depot and which would provide a downtown project five minutes' walk from the business center.

Complete Work At Tulsa Port

C. W. SHORT, Jr., manager of the Tulsa, Okla., municipal airport recently announced the completion of a beautification program which includes a retaining wall on both sides of the field. The field has been enlarged by 20 acres; has been graded and tile-drained, and a ceiling projector has been installed. In addition grass has been sown over the field in front of the hard-surfaced runways. The retaining wall is adjacent to the runways on both sides.

36 MICHIGAN PORTS BEING COMPLETED

WORK HAS been resumed on 36 of Michigans' airport development projects financed out of Federal Relief Funds, and they may be completed this coming August, according to officials of the State Board of Aeronautics, who said adequate funds are available for the completion of the program.

Woodland Holds Air Show

FORMAL DEDICATION of a new hangar featured an air show held at Best Field Airport, Woodland, Calif., recently. Carl E. Wulff was chairman of the show having been elected by the pilots interested in staging it. The new hangar was constructed with funds raised at an air show held at the field last year.

Pendleton Airport Dedicated

THE NEW Pendleton, Ore., airport was dedicated in a typical Western atmosphere with a round-up parade. Speakers included Mayor Joseph Carson, Portland, and Mayor Jack Allen, Pendleton.

Tex Rankin, Portland pilot, and a troupe of his acrobatic fliers provided the thrills for the crowd.

Pendleton is now on a direct East-West route with regular schedules maintained by United Air Lines.

Airport Changes Name

EFFECTIVE JUNE 21 the name of United Airport, Los Angeles, was changed to Union Air Terminal. This decision, according to president Fred Denslow has been dictated in the interests of transport lines, the traveling public, airport tenants and Southern California business. Because of its location, facilities, meteorological conditions and other advantages, this airport has become in less than four years one of the foremost in the entire nation in point of passengers, schedules and general flying activity.

Kansas Has 24 New Airports

AS A RESULT of the CWA airport program, Kansas has 24 new airports and according to Fred Grieme, airport advisor, most of them are ready or almost ready for operations.

The cities which have acquired landing fields under the program are Atwood, Chanute, Coffeyville, El Dorado, Fort Scott, Garnett, Dodge City, Pratt, Medicine Lodge, Liberty, Garden City, Goodland, Oakley, Norton, Wakeeney, Hays, Wilson, Salina, Topeka, Kansas City, McPherson, Hutchinson, Pittsburgh, and Lawrence.

North Dakota Airport Ratio High

WHEN ALL work on airports in the state is completed, North Dakota will have more fields per capita than any other state in the Union, according to Noel Solien, state airport advisor under the CWA airport program.

Total funds expended or allotted for 57 airports constructed or improved under the CWA exceeded $180,000. The airway system brought about by the work involves proposed state air routes and existing commercial lines, one of which is the northern transcontinental route to Seattle.

Proposed state routes are from Pembina toward Cheyenne, Wyo., via Devils Lake, Fessenden and Bismarck; Portal toward Watertown, S. D., via Minot, Jamestown, La Moure and Oakes; Grand Forks toward Glasgow, Mont., via Lakota, Devils Lake, Minot and Williston. A spur from Minot extends toward Pierre, S. D., through Bismarck.

New Airport for Lexington

A NEW municipal airport is being constructed five miles north of Lexington, Ky., on a tract of land measuring 106 acres. Grading and leveling work are progressing under the direction of N. N. Baxter, field manager.

Until the new field is ready for use, aircraft are using the old municipal airport, Halley Field, where service and maintenance are available during the day.

Waco Field Being Improved

AMONG AIRPORTS projects under way in Texas is the work going on at Rich Field, Waco. Workmen are completing the installation of boundary lights and markers. Other work being done on the field includes a general clean-up program under the direction of Roy Corwin.

Dansville Hangar Nears Completion

WORK ON improvement of the municipal airport at Dansville, N. Y., is well under way, with the erection of a $16,000 steel and concrete hangar proceeding rapidly under direction of Lynn E. Pickard, airport manager and project superintendent. There are 113 men, including 25 skilled laborers, at work in two shifts on the airport, with the weekly payroll exceeding $1,000. Joseph Donlay of the North Park Realty Company, Buffalo, has charge of constructing the hangar, and Henry V. Roelofs, Livonia, is supervising engineer.

Dallas Gas Tax Abandoned

ASSISTANT CITY Manager David Robinson of Dallas, who is also in charge of Love Field, the local municipal airport, has announced the abolition of the three-cent tax on each gallon of gasoline and the substitution of a hangar fee or other charge as one of the principal changes to be made at the field.

Personalities

by Baldwell

● YOU'VE PROBABLY noticed that if anything keeps going long enough it eventually gets around to the point where it started, proving, if anything, that we and the world simply run around in circles. Take the world, for instance, it travels millions of miles through space each year, but at the end of 365 days it's right back where it was 365 days before. If it hadn't moved at all it would have made just as much progress. And as for a man, well, he starts off as a helpless baby, grows up, grows old, and in time enters his second childhood.

What brings this to mind is an old infant named Earl R. Southee, General Manager of the Soaring Society of America, Inc., at Elmira, N. Y. Earl started off years ago flying kites, worked up to motored airplanes, and now is moving back, via gliders, to the days of his youth. In a year or two he'll probably have a little balloon on the end of a string and be eating Wheatena and listening to Uncle Don on the radio. Once an old airplane pilot goes back to gliders it's only a question of time when his grandchildren will be giving him a kite for Christmas.

Well, don't take me seriously—I'm only having a little fun with Earl, who is a swell fellow and can take it with a grin. This soaring in motorless planes really is great sport, and from what little I've seen of it I should say that any airplane pilot could get into a glider and learn things about the air that he never would suspect so long as he always had an engine to haul him along. Flying only with the aid of the wind and your own wits is clever, and I admire anyone who can do it successfully. Strapping a small motorless airplane to your fanny and going somewhere with it is quite a trick, and you have to be a bit of an old slicker to get more than a mile away from your starting point without coming down. Up at Elmira a couple of years ago I watched the boys sailing back and forth along a ridge for hours at a time, sometimes with three of them in close formation, and it made a pretty sight. Of course, I know that a lot of old airplane pilots look with amusement at this sport, but it is a sport, not a business or a military proposition, and should be compared to other sports, not to motored flight.

Earl R. Southee was born at Binghamton, N. Y., May 15, 1892, and was graduated from the University of Pennsylvania in the Spring of 1925 with the degree of B. S., which means Bachelor of Science, not what you think. It took 33 years to get the old boy completely educated, which is pretty nearly a record for slow-motion education. In fairness to Earl, however, I should add at once that he stopped taking aboard education in 1913, went in for aviation, joined the Army, and did barnstorming after the war, only hitting the Higher Education Mill in the later stages of his career. It's a funny thing about old pilots; they often quit school early in life, fly for a time, and then go back and take courses in this and in that. They start off refusing to learn anything, and end up as hounds for learning. I've seen it in dozens of cases. Only the other day Casey Jones told me that he was thinking of enrolling in the advanced kindergarten class, and I may go in with him. We old pilots try to keep up on our larnin'. Glenn L. Martin and I undoubtedly will end up flying gliders and cutting out paper dollies.

Well, we were breaking Earl R. Southee up into his constituent elements. It was in 1913 at the Syracuse State Fair that Earl worked for a group of old barnstormers as a mechanic. That is, he told them that he was a mechanic; and they believed him until it got so that none of the engines would run. Then Earl moved on and went with a different group of free balloon pilots where the going as a mechanic was simpler. All a balloon mechanic had to do was feed the fires and get the balloon inflated and then go out and retrieve the balloonist. Even Earl could do that, back in 1913. Small boys used to watch him with envy and refer to him as "one of the aviators." Smoke kept getting in his eyes, so he quit and went to work for Curtiss at Buffalo in 1916. They were in production, going full blast, and turning out three seaplanes a week for the British Government, which had a war on its hands, in addition to its annoyances with those early Curtisses, which also annoyed Earl so much that in June of 1916 he went to Newport News, Virginia, where Captain Baldwin was running the Curtiss Flying School. Here Earl got to flying around on Curtiss pushers and the original Jennies with Vic Carlstrom, Walter Lees, Eddie Stinson and Stewart Cogswell.

Earle Southee, who sails on the breeze with the greatest of ease

In March, 1917, Earl was ordered to the Princeton Flying School where Hobey Baker, Col. Guy Vaughn, Elliott White Springs and others were in training. Elliott hadn't yet published War Birds and hadn't got into the habit of reading to his friends from his collected works; everybody liked him at that time, not suspecting that he was to become an author. When this group went overseas, Earl was sent to Dayton as an instructor, and in December of 1917 he was sent to Ellington Field, Houston, Texas, with Pop Cleveland to battle with the students. I consider Earl and Pop early aviation martyrs. There was an amusing war on, and they had to stay behind instructing. It was all very sad, and often somewhat annoying. In April, 1918, for example, when Earl should have been flying safely against the Germans, a pupil casually spun him into the ground and a nearby hospital. But he grew together again in time to assist in the inauguration of the country's first air mail service, the Army operation between New York and Washington in May, 1918. He was the fellow who bought a package of Mail Pouch tobacco so they could get a picture of a mail bag to paint on the old Curtiss R's. This service to aviation never has been noticed or adequately rewarded. Some time when Jim Farley, one of my favorite comic characters, is thinking of "helping" the Air Mail again he might give Earl a medal.

After service at Chanute Field and Rockwell Field, Earl left the Army early in 1919, went barnstorming, went back to college, worked for three years with Aetna Casualty and Surety Co. in a special engineering insurance department, was New York representative for Kendall Oil Co., and then went with Curtiss-Wright, a sort of aerial Sargasso Sea where hundreds of old pilots finally drifted, floating sluggishly round and round until they sunk or were made manager of Valley Stream. Earl was Regional Sales Manager for the Southeast, where in 1929 he was bombarded by hundreds of ferry pilots bringing him more and more Robins and Fledgelings and Cessnas, which were being built by the hundreds, for at that time Prosperity was considered to be a permanent thing, like taxes and corns on the little toe. At the stroke of the gong ushering in the Depression Earl quit selling and conducted mechanics' schools at Boston and Valley Stream. And now he has moved back to gliding and soaring, as General Manager of the Soaring Society of America. He lives in Box 222, Elmira, New York, which strikes me as the acme of compressibility.

● EACH YEAR my dear friend, C. G. Grey, Editor of The Aeroplane, London, sends me a copy of Jane's "All The World's Aircraft," compiled and edited by Mr. Grey and Leonard Bridgman, working in cahoots, as it were. I have an idea that Leonard does most of the compiling, which is arduous work, while C. G. G. does the more ponderous but less tiring work of editing. All The World's Aircraft is an amazing book, an encyclopaedia, no less, of all the airplanes and engines in the world. The 1933 edition contains authoritative material about 625 different planes made in 21 different countries, and 322 engines made in 10 countries; together with the aeronautical progress in every country, from Abyssinia to Yugo-Slavia, from Albania to Uruguay. It is aviation's most interesting and informative book.

The amount of work required to collect and compile all of this information is simply staggering to the feeble imagination of one who like myself, hates work in any form. And I am so moved to admiration for the stamina and endurance of anyone who can accomplish such a herculean task, that I am glad to do a little log-rolling for that excellent work and to advise you that it may be purchased through the Book Department of Aero Digest. It is the most valuable reference work in aviation, and I strongly recommend it not only as a reliable compendium but also as something heavy enough to prop open a door

Leonard Bridgman

with, or to throw at a meowing cat with telling effect. On one occasion I threw it at my wife, but she snapped right back at me with the *Encyclopaedia Britannica* in 24 volumes, and the friendly encounter ended in a draw, more or less. However, Jane's comes in only one compact volume, while the *Britannica* comes in two dozen. At first glance this discrepancy might seem to have given the good frau a telling advantage, but I may say that with all 24 volumes she landed only once, with Volume 13, while I clipped the target with one volley and my one volume of Jane's. It was all in a spirit of good clean matrimonial fun.

Writing to Leonard Bridgman recently, I suggested that he favor me with a biographical sketch, that I might advise the six listless readers of this department how a real literary laborer got that way. "I was born," he writes, "within the sound of Bow Bells and passed my first eighteen years in blissful ignorance of

Water color sketch by Bridgman

what I should be learning to fit myself for—the clarion call which brought even Siam and Uruguay in on our side." (He's referring to the war 1914-'18, in case you don't know.) "What a mess it all was! I joined the Honorable Artillery Company (which incidentally has a branch in Boston, Mass.) as an infantryman in 1915; and to this, the oldest regiment in the British Army, I owe my knowledge of the Lewis gun, the mechanism of the beer engine in the Sergeants' Mess at the Tower of London, how to roll puttees, dodge military policemen, dine at the Savoy on a Corporal's pay, shoot straight, and grumble. In 1918 I was gazetted to a commission in the R. A. F. and sent to Farnborough where I drilled the troops, conducted drafts, attended court martials, signed thousands of forms, and in other words did my bit toward defeating the dastardly Hun.

"After three months at Farnborough I was posted to an anti-submarine squadron on the East Coast and lived the life of a country gentleman, shootin', fishin', and occasionally flyin'. Officially I was a technical officer, the infantry having left me unfit to pass the medico as fit for flying; but I had a lot of back-seat flying in such machines as DH 4's, 9's, and 9a's, Blackburn Kangaroos, 0/400's, although I was never officially graded an observer. Flying over the North Sea out of sight of land on 2-hour patrols with nothing to do except wonder which of the flying wires will break first, how long a DH 9 would float without air bags, why the bloody tail doesn't come off and be done with it instead of just vibrating into a meaningless blur, and why the devil I joined the Air Force—all helped to convince me of the uselessness of war except for those who are fortunate enough to make capital out of it."

On demobilization in April, 1919, Leonard Bridgman joined the staff of *The Aeroplane* as an artist, and gradually worked up to the exalted position of Deputy Editor of what has been considered one of the most individualistic aeronautical journals in the world. For fifteen years he labored with Mr. Grey on that excellent publication, doing amazingly good work which we chaps on other aviation magazines around the world always have greatly appreciated. Last April, when *The Aeroplane* was purchased by Temple Press, Ltd., a millionaire concern which publishes a group of motoring papers, Leonard Bridgman resigned from *The Aeroplane*. Fifteen years is a long sentence and we all tend to get fed up with whatever we are doing.

However, at the present moment my old friend Leonard Bridgman has leaped out of the accursed and binding editorial harness and is determined to free-lance and take a vacation, giving his talents as an artist a fling. On this page I reproduce one of his swell drawings, a Nieuport Scout of No. 29 Squadron, R.F.C., which he very kindly sent to me. If any American pilots would like drawings or water-colors or oil paintings of some of the war-time types they flew, they may get excellent ones from Bridgman, whose address is 20 Tufnell Park Road, London, N. 7, England. He possesses the rare skill to put on paper or canvas an airplane without horns or frills, and makes you believe that it actually is flying.

April Exports Total $1,318,391

FURTHER GAINS in export business, both in volume and value, were recorded in April by the American aeronautical manufacturers. A total of $1,318,391 was realized from the sale of 23 planes and 88 engines, together with a sizeable amount of parts and accessories.

The Republic of Colombia in South America was the purchaser of the largest amount of American equipment during the month when she spent $345,113 for 11 planes, 1 engine and parts and accessories. Germany, as in the past few months, was again one of our best customers. Forty-six engines, valued at $245,167 and $16,405 worth of equipment brought her total purchases to $261,572. China again took her place with the leading importers of our products by spending $221,619.

Colombia spent the greatest amount for aircraft, $293,642; Germany for engines, $245,167; Peru for parachutes, $1,580, and Russia for parts and equipment, $96,089. Russia's total purchases equaled $246,545.

The 23 planes represented a total value of $544,036. The 88 engines were worth $477,257 and the sale of accessories, parts, etc., came to $297,098.

Porterfield Introduces New Plane

A NEW-TYPE, two-place cabin monoplane, engineered and produced by E. E. Porterfield, Jr., has been announced by Porterfield Aircraft Corp., 1328 Locust St., Kansas City, Mo. Powered by a 60-horsepower LeBlond engine, the plane incorporates many new features.

This announcement heralds the return to the industry of Porterfield, formerly head of the American Eagle Aircraft Corp., who for some time has been working on this new job. The plane offers maximum visibility and passenger and pilot comfort; it is equipped with dual controls and a sturdy air-wheeled landing gear, combined with a gliding angle which permits landings in small fields and restricted areas.

Much thought has been given to cabin entrances as evidenced by the wide doors, and appointments include the latest in instruments and finishings.

One of the first small and low-priced airplanes introduced to the industry was an American Eagle. At that time, Porterfield was actively connected with the American Eagle Aircraft Company.

AIR RACES TO BE HELD IN CLEVELAND

THE 1934 National Air Races will be held at the Municipal Airport in Cleveland from August 31 to September 3. Clifford and Phillip Henderson will be in charge of the event which will be held over a period of four days following the success of a similar plan at Los Angeles last year.

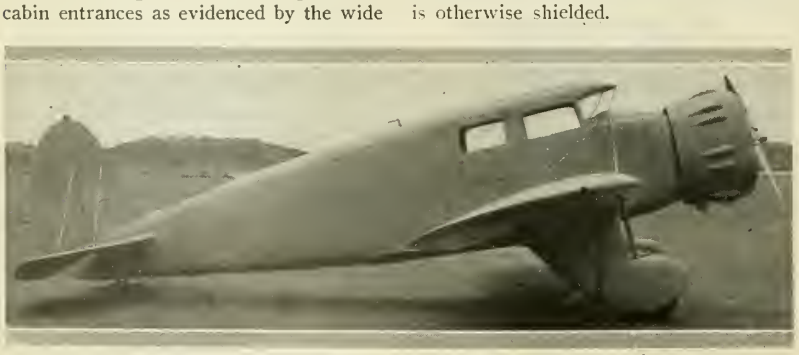
New Cabin Plane Marketed

THE KINNER Airplane and Motor Corporation, Ltd., Glendale, California, recently introduced a new 4-place externally wire braced low-wing cabin monoplane, powered by a 300 h.p. Kinner engine. Featuring high top speed and low landing speed the new plane has a service ceiling of more than 17,000 feet and climbs, fully loaded at sea level, 1100 feet per minute.

Provision is made for a pilot and three passengers, 190 pounds of baggage, 85 gallons of gasoline, which gives more than four hours of cruising, and six gallons of oil. Equipped with flaps, the plane lands at 46 miles an hour and cruises at 150 m.p.h. Top speed is 165 m.p.h.

Standard equipment includes a Hamilton-Standard metal propeller, electric generator, N. A. C. A. cowl, Eclipse electric starter, safety glass, Westport radio receiving set and 8.50 × 10 semi-balloon tires. Ball bearing controls are used throughout and a complete set of standard flight instruments are also provided.

According to Robert Porter, president, the plane is bonded for radio and the engine is provided with special radio shielded magnetos and spark plugs and is otherwise shielded.



Newest 4-place cabin plane introduced by Kinner Airplane and Motor Corporation

204 Planes, 612 Engines Produced

WHILE THE production of commercial aircraft engines continued to absorb most of the increased manufacturing activity of the aeronautical industry, fewer aircraft, both commercial and military, were responsible for a decrease in general aeronautic manufacture in the first three months of this year.

Production of commercial engines for the first quarter of 1934 showed a marked improvement over the same quarter of the preceding year, according to the Aeronautical Chamber of Commerce of America, and the number of units produced in this period more than equaled the production of the first five months of 1933. All told, 487 engines were produced for the commercial market and 125 for the air services. The total value of all engines produced during the period being considered was $3,388,125, of which $2,493,465 was for commercial engines and $894,660 for military engines. The former is an increase of 143.4 per cent over 1933 figures; the latter a decrease of almost 10 per cent.

Commercial airplanes showed a drop in units manufactured, but the value of those that were produced exceeded that of the same quarter of 1933. Eighty commercial and 124 military planes were built, compared to 93 and 149 units respectively, in 1933. The total value of all units produced was $2,776,986 divided into $2,190,335 for military and $586,651 for commercial aircraft. The latter is 29.5 per cent greater than in the previous year.

Sales of both aircraft and engines, military and commercial, the Aeronautical Chamber reports, showed an increase of approximately 5 per cent over the first quarter of 1933 when the total reached $6,130,155. Aircraft sold included 92 commercial and 124 military jobs; engines sold included 465 commercial and 125 military.

In addition, the Chamber reported the sale of $685,296 worth of airplane spare parts and $777,659 worth of engine spare parts. Also, 11 sets of floats were manufactured and 12 delivered.

Waco Sales Increase

WITH THE plant operating at capacity and employment near a new high, Clayton J. Brukner, president of Waco Aircraft Co., Troy, Ohio, reported a steady rise in business.

During the first four months of this year, more than 100 planes were sold and indications point to the possibility of selling more than 150 planes before the end of the first six months, Brukner said.

Foreign sales have expanded so that they now form a substantial part of Waco's business, and during May, 13 planes were sold for export purposes.

It's the FRAMEWORK *that counts*

-when strains are greatest!

From whatever source the test may come—severity of the elements, landing shocks, rapid climbing, stunt flying, or the weight of huge motors—the framework of the airplane must bear the brunt of the strain. No substitute for reliability is possible in the selection of tubing for such a purpose.

The most thorough tests of materials, the most rigid control of processes, and the most vigilant examination of structure, give to NATIONAL-SHELBY Seamless Aircraft Tubing an exceptional degree of dependability.

NATIONAL Engineers will be glad to cooperate with designers and builders of aircraft in the best application of tubing to their particular requirements. Ask for descriptive booklet on—

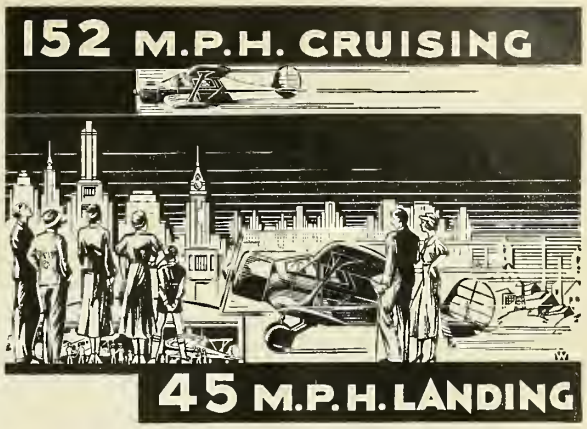
America's Preferred Aircraft Tubing

National-Shelby Aircraft Tubing is made to meet United States Army and United States Navy specifications. Carried in stock by distributors at convenient points throughout the country and kept in separate, individual lots with which actual test reports can be furnished at the time of delivery. Inquiries addressed either to the manufacturer or to the nearest distributor will receive prompt attention.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.

Subsidiary of United States Steel Corporation

NATIONAL-SHELBY AIRCRAFT TUBING



In the matter of speed the Beechcraft compares with the performance of airplanes built only for racing. But that is as far as the comparison goes.

For, the New 225 h.p. Beechcraft makes an easy landing at a safe 45 m.p.h. The landing gear, which is retracted in flight, decelerates the gliding speed of the plane when lowered into landing position. Specially designed wing flaps increase the lift and are a further aid to bringing the Beechcraft down at a slow speed, under perfect control.

The cabin of the Beechcraft is designed for big people—people with long legs and broad shoulders. There is also a large compartment for luggage. Appointments are conveniently placed and are rich in design. Insulated walls muffle the sound of the motor and permit conversation in easy tones.

So, the next time you hear the 225 h.p. Beechcraft compared with racing planes, remember the reference applies only to its high speeds.

The BEECH AIRCRAFT COMPANY

WICHITA, KANSAS

(*Continued from preceding page*)

Alaska Inspector Appointed

DESIGNATION OF Murray Hall, Department of Commerce aeronautical inspector to devote his full time to Alaskan aviation activities and to be permanently stationed at Juneau, Alaska, was announced by Director of Aeronautics, Eugene L. Vidal.

Inspector Hall will handle all aeronautical matters in the Territory. Heretofore, an inspector has gone to Alaska once each year to handle licensing, inspection and other duties, but activities have reached the point where the full-time attention of an inspector is needed. Mr. Hall has been engaged in inspection work with the Branch since 1929. First appointed a field inspector in the Detroit district, he has since served in the Atlanta, Chicago and New York districts.

Date for Elimination Race Set

THE National Balloon Race of 1934 will be held at Legion Field, Birmingham, Ala., on July 28. Winners of first, second and third place will constitute the American team which will compete in the Gordon Bennett International Race which starts from Poland, September 20. This year the event will take place after dark with the first contestant leaving the field at 9:30.

Whirlwind Approved for 440 H.P. Rating

THE NINE-CYLINDER Wright Whirlwind, designated technically as the R-975-E, received a rating of 440 h.p. at 2200 r.p.m. at sea level, from the Department of Commerce recently upon the successful completion of a 50-hour endurance test. It holds other ratings at 330 h.p., 365 h.p. and 420 h.p.

Although the 440 h.p. job is now being offered for commercial use for the first time, this engine has been operated in military service during the past two years. It has a compression ratio of 6:1; blower ratio of 10.15:1 and uses Octane 87 fuel.

(*Continued on following page*)

Digest of Recent Events

Jean Batten Sets New Flight Record

A NEW record for women was made by the New Zealand aviatrix, Jean Batten, who flew from England to Australia in 15 days 23 hours 25 minutes to better the mark made by Amy Johnson Mollinson by about four and a half days. The 24-year-old flier used a five-year-old Moth for the 16,000-mile flight. The absolute record for the flight is held by C. T. P. Ulm, who with three companions flew the distance in 6 days 16 hours 45 minutes. MAY 23.

French Flier Exceeds World's Land Plane Speed

RAYMOND DELMOTTE, French flier, established what is claimed to be a new world's speed record for a 100-kilometer course, flying 268.06 miles an hour from Villesauvage to La Marmagne in 13 minutes 54 seconds. Delmotte held the record a year ago, but Jimmie Wedell did 266.08 miles an hour to set a new standard for the course which measures about 62 miles. MAY 24.

Turner Sets Another Airplane Speed Mark

ROSCOE TURNER landed at the Chicago Municipal Airport after flying from Pittsburgh, 400 miles away in 1 hour 43 minutes or at an average of 228 miles an hour. Turner was flying the P. & W.-powered specially built racing plane which already has made a considerable number of point-to-point records. Most of the flight was made at 5000 feet or higher, Turner said. MAY 26.

Codos and Rossi Span Ocean Again

ALTHOUGH CONSIDERABLY short of their goal, Paul Codos and Maurice Rossi successfully flew from Paris to Floyd Bennett Field, New York's municipal airport in their Hispano-Suiza-powered *Joseph Le Brix*. Excessive vibration caused them to halt their plans for an attempt to set a new long-distance, non-stop flight scheduled to terminate at San Francisco. MAY 28.

"Maxim Gorky" Flies With 40 Passengers

THE *Maxim Gorky*, largest plane ever built in Soviet Russia, successfully made its maiden flight over Moscow carrying 40 passengers. Eight engines, developing a total of 7,000 horsepower, drive the ship along at a cruising speed of 135 miles an hour. Two motors are mounted above the cabin and there are three on each side of the wing. The wing itself has a 200-foot span. JUNE 17.

DuPont Sets World's Distance Record in Glider

A NON-STOP flight of 155 miles brought the world's distance record for motorless flight to Richard duPont and his Bowlus-du Pont sailplane. duPont flew from Elmira, N. Y., where the annual soaring meet was in progress, to the Somerset, N. J., airport, a distance 19 miles further than the old record held by the late Guenther Groenhoff of Germany. At times, duPont had to attain an altitude of 3,000 feet to clear the mountains. JUNE 25.

Coming Events

Distance-Endurance Contest

Distance and Endurance Contest for 100,000-franc grand prize and 5,000-franc cup. Sponsored by The Aero Club of the West of France in conjunction with the Aero Club of France, Angers, France. JULY 8.

Soaring Meet

Fifth Annual National Soaring Contest, Elmira, N. Y. JUNE 23-JULY 8.

King's Cup Race

Start of King's Cup Race, Hatfield, England. JULY 13

Speed Races

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-23.

Rhoen Soaring Contest

Fifteenth Rhoen Soaring Contest, Wasserkuppe, Rhoen, Germany. Sponsored by Deutsche Luftsport Verband. Total prizes, $20,000. JULY 22-AUG. 5.

Elimination Race

NATIONAL Balloon Race of 1934. Elimination event to pick team to represent United States in Gordon Bennett Balloon Races. Legion Field, Birmingham, Ala. JULY 28.

Air Tour

Third Air Tour Around Italy. AUG. 1-15.

Women's Air Meet

Women's National Air Meet, Dayton Municipal Airport, Dayton, Ohio. AUG. 4-5.

Polish Tour

International Touring Challenge of the Polish Aero Club AUG. 28-SEPT. 16

National Air Races

1934 National Air Races, sponsored by National Air Races of Cleveland, Inc., and under the management of Clifford and Phillip Henderson, 103 Terminal Tower Bldg., Cleveland. To be held at Cleveland Municipal Airport. AUG. 31-SEPT. 3.

Gliding Contest

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park. SEPT. 15-30.

Bennett Balloon Races

Gordon Bennett Balloon Race. Auspices of Polish Club, Poland. SEPT. 20.

State Officials' Meeting

FOURTH ANNUAL Meeting, National Association of State Aviation Officials, Cheyenne, Wyo. SEPT. 27-29.

MacRobertson Race

London-Melbourne International Air Race. Speed and handicap event. Under regulations of F.A.I. and competition rules of Royal Aero Club. Sponsored by Sir MacPherson Robertson. OCT. 20.

The Private Utility Plane of 1934

Presenting the New DeLuxe Model 90

Monocoupe

Registered Trade Mark

POWERED WITH THE LAMBERT R-266 90 H.P. ENGINE

Flies *120 miles* in an hour on only *5 gallons* of gas! Top speed—140

Sensational, unique developments of design and many refinements are incorporated in the new DeLuxe Model 90 Monocoupe. Specially designed flaps on the trailing edge of the wing are one of the sensational features. The flaps reduce the landing speed and run of the plane, decrease the take-off run and permit safe and practical operation from much smaller fields.

The flaps are lowered or raised in *one second* by a positive push-pull control inside the cabin, independent of all other controls. *No winding.*

Extra Performance with Wing Flaps

TAKE-OFF—FULL LOAD

Without flaps	428 feet—12 seconds
With flaps	328 feet—10 seconds

LANDING RUN—FULL LOAD

Without flaps or brakes	400 feet
With flaps but no brakes	162 feet
With flaps and brakes	100 feet

Such exceptional performance, plus refinements which add to flying comfort, ease and utility, make the DeLuxe Model 90 the outstanding private utility plane of the year, and ideal for many commercial uses. Specially designed tunnel cowling reduces head resistance and contributes largely to even higher Monocoupe performance. Redesigned stream-shielding permits wider angle vision. The cabin is *eight inches wider.* The seat is placed farther forward of the rear wing spar, and the door is much wider. The larger instrument panel accommodates extra flight instruments if desired. See list of equipment.

Write for complete details of the new DeLuxe Model 90 priced at $3485. Three other models: Standard Model 90—$2885; Model 125—$4485; Model D-145—$5600.

EQUIPMENT—Standard equipment includes wheel pants, tunnel cowling, wing flaps, parking brake, steel propeller, clock, magnetic compass, altimeter, airspeed indicator, tachometer, oil temperature indicator, oil pressure gauge, 6.50 x 10 semi-air wheels and brakes, dual controls, fire extinguisher, log books, tools, first-aid kit, and wiring for navigation lights.

Nearly 1,000 Monocoupes built and sold.

LAMBERT AIRCRAFT CORPORATION

LAMBERT FIELD, ROBERTSON, MISSOURI

SUBSIDIARIES:

Monocoupe Corporation
Robertson, Missouri.

Lambert Engine & Machine Co.
Moline, Illinois.

With Boeing you learn aviation from the *inside*

BOEING training takes you behind the scenes—shows you in detail the operating methods of United Air Lines—helps you to make the practical experience of aviation's foremost transportation company your *own.*

As a pilot, maintenance man or aviation executive your future will depend on the proper foundation, and Boeing School gives you the broadest foundation of experience in the industry today.

Ground school courses exceed Department of Commerce requirements. The staff of flight instructors is headed by George Myers, veteran air mail pilot with 7,000 hours of experience. His chief assistant has soloed 325 students during his 3,500 hours of dual instruction. Flying equipment includes 8 types of training planes. Location is the Oakland Airport, western base of operations of United Air Lines' Coast-to-Coast and Pacific Coast Lines.

From the time you step into a Boeing School you are surrounded with flyers and flying. When you step out you're *ready* for aviation.

Make your own comparison between trainings. The illustrated Boeing Bulletin, giving enrollment requirements, courses and costs, will help you. The coupon brings it.

NEXT REGULAR ENROLLMENT,
October 1st

BOEING SCHOOL OF AERONAUTICS

Division of UNITED AIR LINES INC.

BOEING SCHOOL OF AERONAUTICS
Room A-7, Airport, Oakland, California

Gentlemen: I am interested in

- ☐ Boeing Master Pilot
- ☐ Limited Commercial Pilot
- ☐ Private Pilot
- ☐ Amateur Pilot
- ☐ Airline Operations
- ☐ Transport Pilot
- ☐ Special Master Pilot (*Open to holders of Transport Licenses*)

Name_____ Age_____

Years in High School_____ Years in College_____

Address_____ Phone_____

City_____ State_____

(*Continued from preceding page*)

Security National Moves

TAKING A lease on the principal runway and four hangars, Security National Aircraft Co., moved from Downey, Calif., to the Metropolitan Airport in Van Nuys where it will have additional production facilities. Several low-wing Security Airster sport monoplanes are now under construction, having been ordered for delivery by dealers throughout the west, according to William B. Kinner, president.

Ten More Vultees Ordered

AMERICAN AIRLINES, Inc., has placed an additional order for ten Vultee transport planes with the Airplane Development Corp., Glendale, Calif., bringing the total number of planes ordered for its use from the company to 22.

The Vultee, which attained a top speed of 241 miles an hour in recent tests, carries 8 passengers and 2 pilots.

New Company Incorporated

ARTICLES OF incorporation have been filed by the Pfafflin Aviation Service, Inc., La Crosse, Wis., with a capital stock of $10,000. The company, authorized to wholesale and retail aircraft and supplies, and to render aviation service, was formed by Raymond V. Edward and Oscar Pfafflin.

Radio Beacon Perfection Sought

A COMPREHENSIVE effort, both practical and theoretical, aimed to increase the efficiency and reliability of radio range beacons by eliminating multiple or split courses that have developed as a radio phenomenon in mountainous country, has been inaugurated by the Aeronautics Branch, according to Rex Martin, Assistant Director of Aeronautics in charge of air navigation. Multiple courses, additional "on course" signals received at points where "off course" signals should be heard, are not evident in level country.

Mr. Martin declared that multiple courses constitute what appears to be the last problem in perfecting the radio range beacons which have been operated by the Department of Commerce for years.

The practical phase of the investigation will center around a specially radio-equipped airplane and L. C. Elliott and D. M. Stewart, who will conduct flight research on the multiple course problem.

The theoretical side involves the seeking of advice of presidents of colleges and universities throughout the United States. Already 71 such executives have been requested by Mr. Martin for their cooperation in the project.

Kinner Plans Increased Production

KINNER AIRPLANE & Motor Corp., Glendale, Calif., had unfilled orders on hand amounting to $140,000 early in May, of which $90,000 was for engines and $50,000 for new planes. Two ships a week were being completed, and it was expected that the output would be raised to three or four per week in the near future, according to Robert Porter, president. The unfilled orders at that time exceeded the total amount of business done in the entire previous year when $126,000 was realized from sales.

According to L. Porter, director of sales, four more planes were recently sold, one each going to Mayor A. F. Rountree of Lake City, Fla.; Joseph W. Harper, Hollywood, Calif.; Richard du Pont, Wilmington, Del., and Mrs. Carmelita Parma, Beverly Hills, Calif.

Public Library Opens Air Exhibit

A HISTORICAL exhibition of books, prints and photographs, tracing the development of aeronautics from the untested theories of the Renaissance to modern aerial photographs is now open in the main exhibition rooms of the New York Public Library, Fifth Avenue and 42nd Street. The prints are from the collection of Mrs. Bella C. Landauer, while the books are from the library's files, supplemented by rare items from the collections of Mrs. Landauer, William A. M. Burden and Philip Hofer. The exhibition is open until October 15, from 9 a. m. to 5 p. m. on weekdays and from 1 to 5 p. m. on Sundays.

Gregor Designs New 2-Place Job

MICHAEL GREGOR, designer of Bird and other airplanes, has resigned as executive engineer of the Seversky Aircraft Corp., to enter the aircraft manufacturing business for himself. He plans to produce a small, two-place sport and training ship to sell for about $1,000.

According to recent tests made with a 90 h.p engine, the plane has a top speed of about 110 m.p.h., cruising speed of about 90 m.p.h., a landing speed of about 40 m.p.h. and climbs, with full load, 1,100 feet per minute. The ship, the first of which was satisfactorily tested by many leading pilots, has a gasoline capacity of 40 gallons and with gasoline consumption at the rate of 5.5 gals. per hour, a cruising range of more than 600 miles is obtainable.

Airworthiness Revision Date Postponed

THE REVISED Airworthiness Requirements for Aircraft (Aeronautics Bulletin No. 7-A) will become effective August 1, 1934, instead of July 1, Eugene L. Vidal, Director of Aeronautics, announced. Aeronautics Bulletin No. 26, "Design Information for Aircraft," a new bulletin presenting material supplementary to the requirements, also will be published under date of August 1.

Postponement of the effective date was necessary to allow time for making additional revisions, some of which were suggested at the recent conference of the Aeronautics Branch with aircraft manufacturers in Washington.

Beechcraft Dealers Appointed

A COMPLETE line of new Beechcraft airplanes manufactured by the Beech Aircraft Co., Wichita, Kansas, is now being displayed at Hangar No. 9, Roosevelt Field, Mineola, N. Y., by W. D. Ward and G. J. Pearson, who recently were appointed authorized agents for the aircraft company in New York City, Long Island, Westchester County and Fairfield County, Conn.

Experts Plan Legal Changes

A NUMBER of suggested changes in two proposed international aeronautical conventions have been decided upon by the United States members of the International Committee of Air Law experts. An effort to have these changes accepted by the full committee will be made before the conventions are adopted in final form.

One of the proposed conventions deals with the international air carrier's liability for damages resulting from collision between two aircraft. The second concerns the obligation of rendering assistance to persons on board an aircraft in distress, and makes provision for indemnity to the rescuing aircraft or vessel.

The American members of the committee are: John C. Cooper, Jr., Jacksonville, Fla.; Stephen D. Latchford, Treaty Division, Department of State; Fred D. Fagg, Jr., Director of the Air Law Institute, Northwestern University, and Richard S. Paulett, Chief, Enforcement Section, Aeronautics Branch, Department of Commerce.

COLLIER TROPHY AWARDED FOR PROPELLER WORK

THE COLLIER TROPHY, awarded annually for the greatest achievement in aviation in America, the value of which has been demonstrated in actual use during the year, was, for 1933, presented to the Hamilton Standard Propeller Co., E. Hartford, Conn. Frank Walker Caldwell, chief engineer of the company to whom particular credit is due because of the development of the controllable pitch propeller, for which the award was made, received the trophy from President Roosevelt.

Foreigners Buy U. S. Ships for Race

FAITH IN the performance and stamina of American aircraft is evidenced in the receipt of orders from foreign fliers intending to compete for the rich prizes offered in the MacRobertson race. Thus far four definite orders have been received and it is expected more will follow from abroad before the race gets under way from London on October 20.

James C. Fitzmaurice, the Irish trans-Atlantic flier, is to pilot a new-type Bellanca. It will be a low-wing, high-speed, long-range job entirely unlike anything yet produced in the Bellanca plant in New Castle, Del.

Sir Charles Kingsford-Smith has ordered a Wasp-powered Lockheed Altair equipped with a Hamilton Standard controllable pitch propeller and K. L. M., the Royal Dutch Airline, will fly one of the new Douglas DC-2 transports. Setting a precedent, the company plans to sell tickets to passengers who wish to fly in the plane during the race.

Marcel DeTroyat, French stunt flier, has purchased a Lockheed Orion, but intends to power it with a Hispano-Suiza engine. It is also understood that Capt. Oswaldo Baldi, Italian pilot, will power his Caproni *Sauro* with an engine manufactured in this country.

30 Planes in Oklahoma Air Tour

THE 1400-mile Oklahoma State Air Tour, leaving Oklahoma City, got under way June 12, led by Burrell Tibbs, flight manager, and closely followed by Moss Patterson, president of the Oklahoma City Aviation Club, and some thirty planes toward Shawnee, the first port of call.

A definite schedule of arrival and departure to and from the 33 airports visited on the five-day tour was adhered to despite the extreme heat and sand encountered.

Complete Waco Line Ready

WACO AIRCRAFT for 1934 include faster and roomier models which retain all of Waco's fundamental features. The complete line consists of three ships, a new super-sport, high-speed, two-place called the Model D; a three-place, high-performing sport and training model, the F3, and the improved Waco Cabin job known as the Model C. Each is designed, built and approved for use as a seaplane.

The Cabin plane is equipped with either the Continental R670-A engine of 210 h.p., Jacobs 225 engine of 225 h.p., or the Wright Whirlwind 250 h.p. The F3 can be powered either with the Jacobs or Continental engines. It features a new instrument panel, improved feather-touch break system, roomier fuselage, new wing root fairings and an NACA cowling as standard equipment.

The new Model D has a high speed of about 200 miles an hour. It features as standard equipment landing lights, flares, radio receiving set, coupe top, dual set of complete instruments and many deluxe appointments both on the exterior and interior of the plane. It is powered by either a Wright Whirlwind 250, 330 or 420 h.p. engine or a Pratt & Whitney 320 or 400 h.p. engine.

United Aircraft Stocks Listed

THE STOCKS of the three companies that will be formed through the proposed break-up of United Aircraft & Transport Corp., have been admitted to unlisted trading on the New York Curb Exchange, and will be traded on a when-issued basis. They include voting trust certificates for 1,043,766 shares of $5 par value stock of United Air Lines Transport Corp.; 521,883 shares of Boeing Airplane Company $5 par value capital stock and 2,087,532 shares of United Aircraft Corp., $5 par value stock.

United Aircraft Corp. will include the eastern manufacturing units as subsidiaries; Boeing Airplane Co., the western manufacturing units, and United Air Lines Transport Corp., the airline group.

Date for Bids on Small Planes Extended

AT THE request of interested aircraft manufacturers, the Department of Commerce has extended the date for the opening of bids for 25 small, inexpensive two-seated airplanes from July 25 to August 27.

The requests for extension were made because in some instances manufacturers plan to make models and conduct thorough wind tunnel tests, and in other cases because the engineering staffs of other manufacturing companies are exceedingly busy at this time.

On May 26, bids were called for the 25 planes which will be used by the inspectors of the Aeronautics Branch in connection with their work in the field.

New-Type Airway Planned

A NEW type of airway installation has been designed to increase the efficiency of the government intermediate landing fields and radio aids to air navigation on the Federal airways system, according to Eugene L. Vidal, Director of Aeronautics.

The system calls for the establishment of adequate and completely equipped intermediate fields at 50-mile intervals connected by beacon lights in a direct line. The fields will have miniature radio beacons and two-way radio stations; they will be boundary lighted, have rotating beacon lights with green characteristics, and suitable runways.

While practically all intermediate fields are lighted at night, many are small, others are off the airways' base lines and none has, as standard equipment, the radio contemplated for installation.

Three airways, now under construction and embodying the new changes, are the Mississippi Valley route, between St. Louis and New Orleans; the Northern route between St. Paul-Minneapolis and Seattle, and the airway between St. Louis and Tulsa. However, the sites for the new installations have not yet been selected.

If the new system proves effective it will be applied to new airways that may hereafter be established. It also may later replace the equipment now in use.

Rex Martin, Assistant Director of Aeronautics in charge of air navigation, and under whose direction the new system will be installed, explained that at each 50-mile field there will be a miniature radio range beacon with effective directional beams up to at least 25 miles in four directions and that there would be no change in the spacing of the large airway beacon lights which now are at 15-mile intervals.

Electra Faster Without Fillets

COORDINATION OF wing and fuselage design rendered unnecessary on the Lockheed Electra the addition of wing root fillets when wind-tunnel tests of the Electra model originally showed the plane to be actually faster without them.

To check in actual flights the results of the wind-tunnel tests, fillets were placed on the plane during speed trials. Later they were removed and the transport gained 2 miles an hour. Confirming the wind-tunnel tests, flight tests further showed maneuverability and controllability remaining substantially the same with and without fillets, while stability was improved slightly with the fillets removed. Elimination of fillets not only improved performance, but saved cost and about 32 pounds in weight.

The first Electra transport already is flying over the Northwest Airlines route. It was flown from the factory in Burbank to St. Paul in 9 hours 46 minutes, averaging 195 miles an hour for the 1900-mile trip. With a payload of 2200 pounds and a gross weight of 9600 pounds, the Electra has a top speed of 221 miles per hour, cruising speed of 203 miles an hour and a landing speed of 60 miles an hour. It has a cruising range of 850 miles, a ceiling of 20,000 feet on both motors and will fly and maneuver with full load on one motor at 6000 feet.

AERO BRANCH NOW CALLED BUREAU OF AIR COMMERCE

THE NAME of the Aeronautics Branch of the Department of Commerce was changed to Bureau of Air Commerce and the office of the Director of Aeronautics is now known as Director of Air Commerce.

The name "Bureau of Air Commerce" more accurately describes the duties and functions of this organization. The change was desirable to prevent confusion between commercial aeronautics as typified by "air commerce" and the aeronautical activities of other government branches.

277 Violations in Six Months

DURING THE last half of 1933 there were 277 flights in which the Air Commerce Regulations were violated and in 104 of these flights accidents occurred, according to the Aeronautics Branch, Department of Commerce.

In all, 383 violations occurred during the flights in question. These were divided into: acrobatics, 102; low flying, 64; licensed aircraft flown by unlicensed pilots, 34; flying without position lights, 23; dual controls connected during passenger flights, 20; numbers not properly assigned, 16, and miscellaneous 124. The miscellaneous violations involved conduct contrary to public safety, flying unlicensed planes in interstate commerce, traffic violations at airports, students violating terms of permits, non-commercial pilots carrying passengers for hire and overloading.

There were also 37 non-flight violations which included infractions not immediately connected with flights such as failure to submit reports required by the regulations and altering licenses.

Feld Succeeds Webb in New York

THE NEW YORK State Aviation Commission at a recent meeting elected Senator A. Spencer Feld of New York City to succeed the late Senator J. Griswold Webb as chairman. Assemblyman James J. Wadsworth, Jr., was elected vice-chairman.

A sub-committee, appointed by Sen. Feld to organize the work for the year, consists of John Dwight Sullivan, Col. George A. Vaughn, Assemblyman Howard W. Dickey, Mr. Wadsworth and Senator Feld himself.

Approved Type Certificates Awarded

THE DEPARTMENT of Commerce has awarded approved type certificates to two aircraft, one engine, one glider and three propellers as follows:

Waco Aircraft Co., Troy, Ohio. Model UKC, four-place closed land or sea biplane, powered by a Continental R670-A engine rated 210 h.p. and equipped with Edo P3300 floats. Weights: (landplane) empty 1745, useful load 1105, gross 2850; (seaplane) empty 2131, useful load 1119, gross 3250. A. T. C. No. 528.

Waco Aircraft Co., model YKC, four-place closed land biplane powered by Jacobs L4, 225 h.p. engine. Weights: empty 1837, useful load 1013, gross 2850. A. T. C. No. 533.

Pratt & Whitney Aircraft Corp., E. Hartford, Conn. Model Wasp Junior-SB, 9 cylinder, radial, air-cooled; rated 400 h.p., at 2200 r.p.m. at 5000 feet. Octane 80. A. T. C. No. 123.

Bowlus-Dupont Sailplane Co., San Fernando, Calif., model 1-S-2100, one-place closed land monoplane, secondary soaring. Weights: empty 365, useful load 190, gross 555. A. T. C. No. 4.

Eclipse Aviation Corp., E. Orange, N. J. Model M2999 Hub; 2 blades. Rated 250 h.p. at 2100 r.p.m. Automatic pitch, steel, special blade shank. S. A. E. No. 20 engine shaft. Weight, 69 pounds. A. T. C. No. 456.

Hartzall Industries, Inc., Piqua, Ohio. Model 669F, 8 ft. 1 in. diameter, 2 blades; rated 225 h.p. at 2000 r.p.m., 5 ft. 9 in. pitch. Laminated birch with brass tipping. Weight (without hub) 30 pounds. A. T. C. No. 458.

Bennett Aircraft Co., Morgantown, N. C. Model Samson CB100, 5 ft. 8 in. diameter, 2 blades; rated 36 h.p. at 2400 r.p.m., 2 ft. 3 in. pitch. Laminated black walnut and white maple with copper tipping. Weight (without hub) 12 pounds. A. T. C. No. 459.

Shell Buys Stinson Plane

PERSONNEL OF the aviation department of the Shell Petroleum Corp., St. Louis, Mo., will use a new Stinson *Reliant* in their airport and airline solicitation work, according to James H. Doolittle, manager of the company's aviation division.

The plane, recently delivered and painted in the standard Shell colors of red and yellow, is the executive model. It has been equipped with a Lear radio set and with additional gasoline tankage to increase its cruising range.

McReynolds Joins Menasco Motors

A. S. MENASCO, president of the Menasco Manufacturing Co., Los Angeles, Calif., has announced the appointment of Charles F. McReynolds, aviation writer and reporter, to take charge of advertising and public relations for the company which builds Pirate and Buccaneer in-line aircraft engines.

LORD HIGH EXECUTIONERS

(*Continued from page* 16)

able safety in weather which air mail pilots negotiate as a matter of course with at least a reasonable degree of safety and certainty, has been demonstrated conclusively. The Army pilots have not been adequately trained, there is no doubt about that. But here again the fault is not Foulois' alone, as the Committee would have us think. A Chief of Air Corps' life is a mixture of "can do" and "can't do." He cannot, for example, make bricks without straw, make experienced pilots without sufficient airplanes, engines, and gasoline; nor can he force Congress to vote the money required to provide the Air Corps with the strength this year which it should have had even in 1931; nor can he successfully combat the General Staff and an aeronautically ignorant pack of politicians. General William Mitchell tried to do something like that, and they retired him to a horse farm.

Our Army Air Corps is undermanned, under-trained, and inadequately equipped; not because General Foulois desired it, or was too incompetent to do anything about it, but because he was not given the means to order matters otherwise. But here again I wish to make it plain that I am not trying to exonerate General Foulois of all blame. Even with the means at his command, I feel that he should have seen to it that Air Corps pilots at least kept pace with commercial aviation's development of instrument and night flying. After all, there is no guarantee that an enemy flying force will attack us on sunny days only; and if we are attacked on the west coast, and half of our Air Corps is on the east coast, it is poor defense to have a force that can fly across the continent only in perfect weather. In short, our Air Corps training has not kept pace with the training and experience of our airline pilots; and if there was an insufficient appropriation of funds to insure that training, then the Chief of Air Corps should have brought that fact to the General Staff's attention. Probably he has done so, in which event the blame for the Army's failure to carry the mails must be shared by the General Staff and by the Congresses which have failed to appropriate necessary funds during the past few years.

In this connection it should be recalled that the Morrow Board in its study of aviation in 1925 recommended the Five-Year plan, which Congress approved the following year, providing that by 1931 the Navy would have 1,000 active planes, the Army 1,800. Today the Navy has 1,000 planes, the Army less than 1,200 planes. It would cost $120,000,000 to bring the Air Corps up to the strength that it should have possessed even in 1931—since which time its strength should have increased considerably more. But it is grossly unfair to blame General Foulois because Congress did not appropriate the money to provide the increase in equipment which the Congress of 1926 voted.

However, it is in the second outstanding part of the report, having to do with the procurement of planes by negotiation rather than by competitive bidding, that the gross injustice of this committee of Headsmen is most glaring and obvious. The report said "The evidence discloses deliberate, wilful and intentional violations of the law by the Chief of the Air Corps aided and abetted by his assistants in charge of procurement".

Herein, I am convinced, the Lord High Executioners have over-reached themselves in their eagerness to provide a victim. For whatever may be said about the negotiating system, General Foulois certainly did not inaugurate it; and so far as I can interpret the English language, that system was given legal sanction by the Air Corps Act of July 2, 1926. Paragraph (k) of Section 1 of that Act reads as follows: (Italics are my own) "The Secretary of War or the Secretary of the Navy *may at his discretion* purchase abroad or in the United States *with or without competition,* by contract, *or otherwise,* such designs, aircraft, aircraft parts, or aeronautical accessories *as may be necessary in his judgment* for experimental purposes in the development of aircraft or aircraft parts or aeronautical accessories *of the best kind for the Army or the Navy,* as the case may be, and if as a result of such procurement, new and suitable designs considered to be the best kind for the Army or the Navy are developed, *he may enter into contract,* subject to the requirements of paragraph (j) of this section, *for the procurement in quantity* of such aircraft, aircraft parts, or aeronautical accessories without regard to the provisions of paragraphs (a) to (e), inclusive, hereof."

(Paragraph (j) limits procurement to American manufacturers, except for experimental purposes; and paragraphs (a) to (e) relate to experimental procurement.)

Bereft of its legal verbiage, I read that Paragraph of the Air Corps Act relating to the Air Corps as follows: "The Secretary of War may purchase in the United States *with or without competition, by contract or otherwise,* such aircraft and parts *as may be necessary in his judgment* for experimental purposes in the Army. Then if from these purchases new and suitable designs considered the best for the Army are developed, *he may enter into contract for the procurement in quantity of these aircraft.*"

The Chief of the Air Corps, by authority of the Secretary of War, purchased planes by this method, by negotiating with manufacturers for them, *as by law he was clearly authorized to do.* Now our precious Committee of Hangmen declares that his doing so "discloses deliberate, wilful and intentional violations of the law." If it does, then the world is turned upside down, and my old grandmother is a member of the General Staff.

You may recall Bert Williams' old song about the Darktown Poker Club that held a session at which one of the members was thought to have cheated. Razors and revolvers were drawn just as the lights went out; and when they were turned on again one of the players was discovered to be extinct. The question immediately arose, "Who would take the rap?" As someone thoughtfully pointed out, when the police arrived they would be sure to ask, "How come this brother ain't alive?" It was urged on Bert that he should admit the deed, as it would be a remarkable opportunity for him to gain a lot of notoriety and get his name in the papers. Bert agreed that it would be a wonderful opportunity for someone —"Somebody else—not me!" I imagine that General Foulois feels pretty much the same way about this attempt to pin him down as the goat. He should tell them, "It's a wonderful publicity opportunity for someone—General MacArthur, for instance. Oh, it's a splendid opportunity for somebody! Somebody else—not me!"

ANTI-FRICTION BEARINGS

(*Continued from page* 35)

at high speed. In instruments operating on the gyroscopic principle, small and accurately-constructed ball bearings are needed to support the rotor which may revolve as high as 20,000 r.p.m. Other equally small bearings are needed in the gimbal supports of the gyroscope. Such bearings must be very smooth-turning if accurate results are to be obtained from the instrument. Many of the bearings for such applications are of the full type (without a retainer) and the balls rotate directly on the hardened and ground shaft or pin. A typical bearing of this construction is shown in figure 9. The balls in this instance are guided between the hardened and ground side plates rigidly attached to the outer ring. Endwise location of the unit is accomplished through contact between the end of the pin and a hardened ball seated in the adjusting screw.

In an article of this length, it is impossible to cover all of the many new and unusual bearing designs developed in the past few years for aircraft application. It is hoped, however, that some of the types disclosed herein will be of interest and possible help to designers in the solution of some of their bearing problems.

AIR—HOT AND OTHERWISE

(*Continued from page* 11)

ience of indefinite length, which would be cancellable for cause shown.

Complete divorcement, after the end of this calendar year is demanded of air mail contract holding companies from companies interested in any other phase of the aviation industry, except the operation of airports. This provision is entirely too sweeping, is not based on any proven abuses that would justify such condemnation, would tend to interfere with the development of special planes and engines for particular services, will create serious financing conditions for air mail contract holding companies and will cause serious losses to thousands of stockholders.

Section 7(d) of the bill is an attempt to evade the provisions of the Constitution prohibiting the passage of a bill of attainder. It has reference, obviously, to the annulment of the former air mail contracts on February 9, 1934, without a hearing. It will tend to disqualify some of the most competent operators in the business, because companies will hesitate to file the affidavit which states the mere conclusion that a particular person has not entered into a combination to prevent a bid. The section is oppressive, as tending to eliminate from employment a group of individuals by putting pressure to bear on the corporate entities, who might otherwise employ them, to refrain from employing them so as to avoid the possibility of a prosecution.

The limitation of the salary of any person to $17,500 a year, as provided by the bill, is unusual. The permission granted to the old companies whose contracts were annulled, to bid for new contracts is evidently intended to limit or destroy claims based on the five-year disqualification penalty of Section 3950. But the old companies cannot bid without complying with the many other burdensome provisions in this new bill.

These are typical of the one-sided stipulations which appear frequently throughout the 21 provisions of the bill. And quite aside from its unfairness to the operators, it is dangerous because it makes absolutely no reference to any policy of including the air transport system as a part of our National defense!

HANGAR CONSTRUCTION

(*Continued from page* 15)

frame hangar, high strength concrete designed in accordance with the water cement ratio is utilized. Additional structural advantage can be attained through light aggregates, such as Haydite.

The rigid frame hangar has considerably less height for an equivalent span than other types, a consideration on airports.

Recently, two structural steel hangars were blown down by hurricane winds when the steel and composite hangars did not have sufficient lateral strength to resist the forces of nature.

In a rigid frame hangar there is an inherent quality in the design which makes it resistant to lateral forces of all kinds, either hurricane or earthquake, and by taking these lateral stresses into account, an advantageous distribution of strain is obtained in the girders.

When there is a parity of cost between the rigid frame and the conventional, permanent type of hangar, there is little comparison between the two structures. Even where there might be a greater first cost in the rigid frame concrete hangar, there are still many tremendous savings, such as freedom from maintenance and painting, lower insurance rates, etc.

It is not intended herein to be critical in any way of present and previous practices in hangar design and construction. It is believed, however, that it is time for structural engineers to develop the hangar to a point comparable with the airplane and other types of buildings.

FOREIGN NEWS IN BRIEF

Australasia

DURING THE last six months passenger traffic over the Qantas, Ltd., route has averaged more than 20 per cent over the figures reported for 1931, 1932 and 1933 and figures for the 1930 peak periods are being approximated. Despite the use of 8-passenger planes, freight is being handicapped because space is required for passengers, and consignments for outlying parts of the route have been turned away almost weekly during the past few months.

Mail is also showing a steady advance, there having been an increased poundage approximating 10 per cent per annum in each yearly period for the past 11 years.

C. E. BARNES, Halston, Warwick, Australia. has received the Qantas Trophy for 1933 for his 17,360 miles of flying in the year during which he experienced no accidents or serious delays. The trophy is to encourage private aviation as distinct from commercial flying and is awarded for excellence in that particular field.

EARLY LAST month a series of meteorological flights began simultaneously at Adelaide, Hay, Bourke, Charleville, Cloncurry, Daly Waters, Hobart and Sydney. At each station a daily flight is made to 10,000 feet and weather conditions and air temperatures noted at each 1000-foot interval. It is hoped that the flights will provide greater knowledge of upper air conditions and offer valuable information on inverted temperatures.

GOLD FIELDS in the New Guinea district are served by four airlines including The Guinea Airways, Ltd., Holden's Air Transport Service, W. R. Carpenter & Co., and Pacific Aerial Transport, Ltd. Between them, the companies own and operate 21 ships to the gold district 35 miles from Salamaua. An additional service was provided by the establishment of a direct line between Lae and Port Moresby, Papua, where steamers are met and mail and other special cargo taken off and given fast transportation to the interior.

AIR MAIL contracts awarded in Australia have gone to Qantas Empire Airways Ltd., between Singapore, Darwin and Brisbane; to C. A. Butler, between Charleville and Cootamundra; to Tasmanian Aerial Services, Ltd., between Melbourne, Launceston and Hobart, and to Macrobertson Miller Aviation Co., for the Perth to Catherine route. The De Havilland planes used on all the routes comprise DH 86's, Dragons and Fox Moths.

SIR CHARLES Kingsford-Smith completed his sixth crossing of the Tasman Sea in the *Southern Cross* when he flew from Ninety Mile Beach (N. Z.) to Mascot, Sydney in 13 hours 25 minutes, a new record between New Zealand and Australia. However, C. T. P. Ulm and a crew carried the first mail from Australia to New Zealand in 11 hours 58 minutes a short while later.

AN AERONAUTICAL institution known as the Hargrave Institute has been formed in Sydney. Its platform includes the establishment of an Australian aviation museum, a library, research bureau and the appointment of an authority for the supervision of aviation records in the Commonwealth.

AN AERIAL and geological survey of North Australia will be undertaken by the government and will cover all of northwest Queensland, the Northern Territory and the north of Western Australia. At least three years will be taken to complete the task.

REFUSAL OF the New Zealand government to finance an entry in the Mac-Robertson air race has caused local business men to form a company to which they are contributing £7,500 to cover the cost of a plane and flight expenses.

MISR AIRWORK is now operating a Cairo-Port Said airline on a tri-weekly schedule, present operations being on an experimental basis. However, if sufficient support is received to warrant it, the line will be continued throughout the year as a regular operation.

Canada

A FLIGHT of four Hawker *Fury* Interceptor fighters piloted by officers of the Royal Air Force will demonstrate at Toronto during the forthcoming centennial celebrations in that city.

CAPREOL & AUSTIN, Ltd., has been appointed distributor for Waco and Fleet aircraft in Ontario and Quebec. The company is operating a seaplane base in Toronto Harbor and is flying cabin Wacos for charter and ambulance work.

AIR TRAVEL on the Vancouver-Victoria division of Canadian Airways, Ltd., has increased to such an extent that it was necessary on many occasions to fly second sections. The bi-weekly service to Bridge River is also taxing the resources of the company since mining companies are rushing in men and material to facilitate early production of their properties.

AIRCRAFT CHARTER Service Ltd., has been formed in Vancouver, B. C., to provide a specialized aerial charter service. The company plans to have available a number of aircraft each suited for a particular kind of flying and will inaugurate its service with a fleet of modern aircraft ranging in size from one to five places of the land and seaplane type.

(*Continued on following page*)

Pratt and Whitney Wasp-powered Boeing 247 for Deutsche Luft Hansa at Templehof Airdrome, Berlin

(*Continued from preceding page*)

France

AIR FRANCE, the consolidated air transport company, operated more than 14 services during the latter part of 1933, not including the trans-Atlantic air mail service. In December alone, the company's planes flew 448,182 miles and carried 2,459 passengers, 251,510 pounds of express and 43,779 pounds of mail.

THE DEUTSCHE de la Meurthe Cup Race, held at Etampes, was won by Maurice Arnoux, who flew a Caudron plane over the 2000 kilometer course (about 1250 miles) in 5 hours 8 minutes 31 seconds, averaging 241 m.p.h. for the trip. The flight was made in two 1000-kilometer stages, one in the morning and the other in the afternoon of the same day. The field consisted of eight starters, one of which was an English entry flown by Lieut. Compter. The other planes entered were two Potez and four Caudron. France now has won the race twice in succession.

Germany

A JOINT airline service between Berlin and Warsaw was scheduled to get under way recently. Polish Air Transportation Company (Lot) and the Deutsche Luft Hansa are to provide daily flights in both directions with provisions made for connections to other points in Continental Europe.

SINGLE-ENGINED planes are to be withdrawn from passenger airlines and will be replaced by multi-engined equipment. For the rest of the year the single-engined aircraft will fly mail and express, but by 1935, they are expected to be retired from service. Experiments are now being made with high-speed equipment in an effort to raise the general average speed of Deutsche Luft Hansa schedules.

THE FIFTEENTH Rhoen Soaring Contest is to be held at the Wasserkuppe, Rhoen, from July 22 to August 5. The contest is national in character, limited to 100 ships, under F. A. I. regulations and sponsored by the Deutsche Luftsport Verband. Prize money totals $20,000 with $4,600 being disbursed each day to the winners in each of the 12 events listed.

Great Britain

THE SHORT *Scylla*, newest passenger plane in the cross-Channel services of Imperial Airways made its maiden flight over the London-Paris route recently as her sister ship, the *Syrinx*, neared completion. The planes represent the latest step in providing maximum passenger comfort over Imperial Airways' routes. They are powered by four *Jupiter* engines, each of 550 h.p. and weigh 32,000 pounds fully loaded. Two main saloons of dimensions larger than railway pullman cars, feature the interior of the planes.

AS WAS the case last year, the 1934 Kings Cup Race, to be held July 13 and 14, will consist of a series of flights, each running in heats starting and finishing at Hatfield Airdrome, with the entire distance to be flown coming to about 800 miles. A number of high-speed planes have already been entered.

THE LATEST Siddeley air-cooled aircraft engine is the new *Tiger* Mark IV, a fourteen-cylinder engine designed for military general purpose and medium sized torpedo carrying planes and for flying boats and larger types of commercial aircraft. It develops its rated output of 700 h.p. at 5,000 feet. Together with an electric starter, it weighs 1,199 pounds, giving one horsepower for each 1.7 pounds of weight. Its overall diameter is about 51 inches and its length 61.5 inches.

FINLAND HAS purchased a number of Bristol *Bulldog* Mark IV single-seater fighters from the Bristol Aeroplane Co., Ltd., for its air force. These planes will be powered by the new-type Bristol *Mercury* engine and are expected to have a top speed, with full load, of more than 200 miles an hour.

Mexico

AIRLINE EXPANSION in Mexico has been rapid in the past few weeks with a number of new services already in operation and concessions to operate others already granted.

The Mexican City-Nuevo Laredo line has been reopened after being dormant since 1928 and semi-weekly service between Mexico City and Tapachula and between Mexico City and Los Angeles has been established. An application for permission to operate an airline between Mexico City and Tiajuana with stops at 10 large cities en route is now pending. Cia Expreso Aereos Mexicanos is the applicant.

REGULAR PASSENGER and express service between Morelia and Huetamo has been established by Compania de Transportes Aereos, S. A., an organization formed by business men in the state of Michoacan in which the line flies. At a later date, it is planned to extend service to Tacambaro, Patzcuaro, Uruapan and Zamora, all also in the state of Michoacan.

FRANCISCO J. SARABIA, and his co-pilot Lieut. Alberto Cortes intend to take off shortly on their projected Mexico-Spain flight. A special field has been built near Merida, Yucatan from which the plane is expected to start. This plane, constructed with funds provided by officials and private organizations and designed by Dr. Michael Watter, technical editor of AERO DIGEST, has a speed of about 170 miles an hour. The pilots hope to cross the Atlantic after flying via Miami and Bermuda and land in Spain 50 hours after the take-off.

Norway

THE NORSK Aero Club's gold medal was awarded to Commander Riiser-Larsen and Commander Lutzow-Holm for their meritorious flights in the arctic and antarctic regions. The club, which celebrated its 25th anniversary in May, at one time numbered the late Roald Amundsen and Leif Dietrichson among its members.

AN AIRLINE between Oslo and Amsterdam in cooperation with K. L. M. is planned by Fred Olsen & Co., of Oslo. Under a temporary arrangement, flights will be made with land equipment once daily in each direction while another line will extend from Oslo to Bergen. Commander Riiser-Larson has been appointed manager of the airline.

South America

AN AIR mail contract between the Argentine government and the Condor Syndicate is understood to provide for the carriage of mail and express between Argentina, Uruguay, Brazil and Europe. The company will fly mail into Rio de Janeiro where it will connect with the aerial service carrying mail to Europe.

SERVICES OF Compania Aeropostal Venezolana have been extended westward to Maracaibo and San Antonio, the latter point being near the Colombian border and the junction point between the Venezuelan and Colombian railway systems. Weekly services over this extension are provided.

A NEW local service in Argentina, flown by La Compania Argentina de Transportes Aeros, got under way between Rosario and Victoria, a distance of about 40 miles. The company is operating four radio-equipped planes and is maintaining a 25-minute schedule between the two cities. By using this service and taking a train, travel time to Buenos Aires is reduced to 5 hours.

COMPANIA DE AVIACION Faucett, S.A. of Lima, Peru, carried 4,257 passengers, 100,676 pounds of express and 8,500 pounds of mail during 1933 when it reported profit in its year's operations compared with a loss in the previous year. Almost 281,500 miles of flying was accomplished by the company's planes.

TRADE LITERATURE.

Lathes for Service Shops

• CATALOG No. 94, containing 72 pages and showing the complete 1934 line of South Bend Lathes, attachments and tools, has just been published by the Technical Service Dept., South Bend Lathe Works, South Bend, Ind.

This most-complete catalog illustrates, describes and prices 96 sizes and types of lathes from small bench lathes up to the heavy 18-inch lathes, and 36-inch large swing lathes. There are several sizes of lathes adaptable for general machining work in aircraft servicing, development and manufacturing.

All lathes shown are of the back-geared, screw-cutting type. These are available in a complete range of sizes. in various motor drives, and in counter-shaft drive models. The catalog shows for the first time the new South Bend Underneath Belt Motor Driven Lathe, which features greater power, quietness, safety and convenience of operation.

Copies of this catalog are available without charge.

NACA Reports

• THE FOLLOWING Technical Notes. Technical Memorandums, and Aircraft Circulars have been listed by the Office of Aeronautical Intelligence of the National Advisory Committee for Aeronautics, Washington, D. C.

Technical Notes: T. N. 495; Effect of the Surface Condition of a Wing on the Aerodynamic Characteristics of an Airplane. By S. J. DeFrance. T. N. 496; A Preliminary Motor-Picture Study of Combustion in a Compression-Ignition Engine. By E. C. Buckley and C. D. Waldron.

Circulars: A. C. 189; D. H. 86 "Express Air Liner" (British). A Four-Engine Biplane. From *Flight,* February 22, 1934.

Technical Memorandums: T. M. 741; The Calculation of Lateral Stability with Free Controls. By Gotthold Mathias. From *Zeitschrift für Flugtechnik und Motorluftschiffahrt.* April 14 and 28. 1932. T. M. 742; Supplemental Data and Calculations of the Lateral Stability of Airplanes. By Gotthold Mathias. From *Zeitschrift für Flugtechnik und Motorluftschiffahrt,* October 14 and 28, 1933. T. M. 743; Fatigue Strength of Airplane and Engine Materials. By Kurt Matthaes. From *Zeitschrift für Flugtechnik und Motorluftschiffahrt,* Nov. 4 and 28, 1933.

Floors and Their Care

• AS AN authority on floors and their care, the Stonhard Company, Philadelphia, Pa., has just published "Over the Rough Spots," which outlines practical treatments to preserve floors and methods to repair and resurface floors that have become rutted, broken or unevenly worn.

Floors are given exceptionally hard usage and there are many things about them and their care that are not generally known. There are known safeguards that can be easily applied. These are described and illustrated in this new booklet, as are means for repairing worn, broken floors; practical treatments for newly laid concrete floors; methods of bonding floors and walls and for waterproofing floors and methods for making floors acid and waterproof.

Sky Advertising

• AN EIGHT-PAGE brochure published by the Sky Ads Division of the Kellett Autogiro Corp., Philadelphia, Pa., and New York, N. Y., provides an insight to the coverage and possibilities available through the use of sky banners towed by autogiros.

A description of the sky banner shows that each is 150 to 250 feet long.

Condor Bomber

• CURTISS-WRIGHT Export Corp., N. Y., has just issued a 24-page booklet on the Condor BT-32 Bomber which is just as interesting as it is informative.

Complete structural details of the plane either as a bomber, ambulance or transport together with photos of particular sections make the presentation most complete. Three view drawings, sections through the cockpit, bombardier, rear gunner and cabin and bomb compartments are especially well-done and give a clearer conception of the structure of the plane. A loose-leaf insert shows the plane with key numbers to all points.

REVIEWS of BOOKS

THE ECONOMICS OF AIR MAIL TRANSPORTATION

By Paul T. David

• A HISTORY of air mail transportation and a chronological report of a study made by the author. It is complete and informative and mostly timely, for it takes the reader right down to the present day, including such facts as the cancellation of the air mail contracts and the Congressional legislative reforms proposed before the new bill was passed.

Complete regulation of air mail transportation by the Interstate Commerce Commission, to become effective at the earliest possible date, with a quick return of the mail to private carriers, are two major recommendations contained therein.

The analysis shows that air transport is regarded as a public utility and is held to be like the railroad industry that good service can only be provided by companies making permanent investments on their respecive routes. It is therefore urged that companies providing good service be granted the right to operate permanently over the routes they serve at rates subject to regulation by an impartial, semi-judicial tribunal.

The study is concluded with a series of recommendations designed to bring about efficient, economical administration of the system and offers a program for the future. Legislation, it holds, should not bar the former operators; should provide divorcement of operators from manufacturing or affiliate transport associates, and should bar the award of more than one of two or more competing or parallel routes to the same carrier. Contracts, it continues, should be awarded for a relatively short period with opportunity presented, at least annually, for changes in schedules, routes and quality and amount of service. Payment, it holds, might be simplified by a rate not to exceed 35 cents a mile for loads averaging 300 pounds, the average to be figured monthly. For loads exceeding 300 pounds, it favors a rate of 3 cents a mile for each 100-pound unit.

The volume is published by The Brookings Institution, Washington, D. C.

THE AIRCRAFT YEAR BOOK FOR 1934

• AS USUAL, the Aeronautical Chamber of Commerce has published a most complete volume concerning aeronautical activities in its Aircraft Year Book for 1934. Although it is quite as large, as full of as much information as heretofore and just as profusely illustrated, the price of the book has been dropped to $3 a copy. The 1934 Year Book is the sixteenth volume in the series.

Seventeen chapters have been devoted to last year's aeronautical activity. Such topics as Government Activities, the Air Transport Code, Laws and Regulations, Army and Navy Procurement are discussed and explained. Other chapters deal with Air Power, Army and Navy Aviation, Air Transportation, Private Flying, Airways and Airports, Lighter-than-Air Craft and Aerial Service.

The chapters on World Aviation and Manufacturing and Engineering are instructive and complete, the latter providing insight to the activity of American manufacturers of aircraft and engines.

The publication is concluded with drawings of aircraft and engines, aviation chronology and records, flying facts and figures, an aeronautical directory and an index.

Books For Sale by the Aeronautical Library

GENERAL

A Rabbit in the Air. *David Garnett*.....$1.50
Aeronautics, A General Text on. *Hilton B. Lusk*.....$3.25
Andree's Story. *Edited by the Swedish Society for Anthropology and Geography*.....$5.00
Around the World in 28 Days. *Linton Wells*..$3.50
Aviation From the Ground Up. *Lieut. G. B. Manly*.....$3.50
Beauty of Flight. *Manfred Curry*.....$5.00
Flying. *James E. Fechet*.....$1.00
Heroes of the Air. *Chelsea Fraxer*.....$2.50
Learning to Fly. *Capt. C. D. Barnard*.....$5.50
Learning to Fly for the Navy. *Lieut. Barrett Studley*.....$2.00
Little America. *Richard E. Byrd*.....$5.00
Pseudo-Security. *J. M. Spaight*.....$5.00
Seaplane Solo. *Francis Chichester*.....$2.50
Speed. *Frank M. Hawks*.....$2.50
Strategy and Tactics of Air Fighting. *Major Oliver Stewart*.....$2.25
The Book of the Autogiro. *C. J. Sanders & A. H. Rawson*.....$1.75
The Book of the Sky. *Matthew Luckiesh, D.Sc.*.....$3.00
The Conquest of the Atlantic by Air. *Charles Dixon*.....$2.50
The Far Horizon. *Henry Wysham Lanier*....$3.00
The Old Flying Days. *Maj. C. C. Turner*..$7.50
The Red Juggernaut (Nat'l Defense). *L. R. Maxwell*.....$1.00
The Sky's the Limit. *Lt. Tomlinson*.....$3.50
The Standard Airpost Catalogue. 1931-32 Edit..$2.00
The Story of Aircraft. *Chelsea Fraser*.....$2.50
The War in the Air. (3 vols.) *Walter Raleigh & H. A. Jones*
Vol. 1 and 2, each.....$7.00
Vol. 3 .....$9.00
Vol. 4 .....$7.00
The World in the Air. *Francis Trevelyan Miller* (2 vols.).....$15.00
Up. "*Jack Stearns Gray*.....$3.00
Wings of Tomorrow. *Juan de la Cierva & Don Rose*.....$2.50
Wings for Men. *Frank Wead*.....$4.00
Wings Over the World. *J. L. French*.....$1.00

ELEMENTARY (GENERAL)

Dick Byrd—Air Explorer. *Green*.....$1.75
Everyman's Book of Flying. *Orville Kneen*...$3.50
Fighting the Flying Circus. *Capt. Eddie Rickenbacker*.....$2.00
Flying and How to Do It. *Assen Jordanoff*..$1.00
If You Want to Fly. *Alexander Klemin*....$2.50
Riders of the Winds. *Edward Shenton*.....$2.50
Skycraft. *Augustus Post*.....$3.50
Skyward. *Commander Richard E. Byrd*.....$3.50
The First World Flight. *As related by the fliers themselves to Lowell Thomas*.....$5.00

BALLOONS AND AIRSHIPS

Aerostatics. *E. P. Warner*.....$4.00
Airship Design. *Charles P. Burgess*.....$9.00
Balloon and Airship Gases. *C. deF. Chandler & W. S. Diehl*.....$4.00
Free and Captive Balloons. *R. H. Upson & C. deF. Chandler*.....$5.00
Men Working. *Norman Beasley*.....$3.00
Pressure Airships. *T. L. Blakemore & W. Watters Pagon*.....$8.00
Up Ship! *Lt. Comm. C. E. Rosendahl*.....$3.00

DESIGN, CONSTRUCTION, OPERATION

Aeroplanes, Seaplanes and Aero Engines. *Capt. P. H. Sumner*.....$4.00
Aircraft Float Design. *Holden C. Richardson, M.S.*.....$5.00
Airplane Mechanics' Rigging Handbook. *R. S. Hartz*.....$3.50
Airplane Pilot's Manual. *Ross Mahacheh*....$2.50
Airplane Welding. *J. B. Johnson, M.B.*.....$3.50
Airplane Structures. *Alfred S. Niles & Joseph S. Newell*.....$5.00
Marine Aircraft Design. *Wm. Munro*.....$4.50
Metal Aircraft Construction. *M. Langley*....$4.50
Oxy-Acetylene Welders' Handbook. *M. S. Hendricks*.....$3.00
Procedure Handbook of Arc Welding, Design & Practice.....$1.50
Screw Propellers (3rd Edit., 2 Vols.). *Chas. W. Dyson*.....$5.00

ELEMENTARY

A B C of Aviation. *Capt. V. W. Page* (new edition).....$1.00
A B C of Flight. *Laurence LePage*.....$1.50
Aerobatics. *H. Barber*.....$3.50
Elements of Aviation. *V. E. Clark*.....$3.00
Elementary Aeronautics. *A. P. Thurston, D.Sc.*$2.50
Elementary Aeronautical Science. *J. B. Hort & W. Laidler*.....$2.50
Elementary Laboratory Aerodynamics. *Arthur L. Jordan*.....80c
How to Fly. *Borrett Studley*.....$3.00
Manual of Flight. *Lenor E. Elm*.....$3.00
Practical Flight Training. *Lieut. Barrett Studley, U. S. N.*.....$5.00
Practical Flying. *Byron Q. Jones*.....$3.00
Simplified Aerodynamics. *Klemin*.....$3.50
Skyways. *General William Mitchell*.....$3.00
The Airplane. *Frederick Bedell*.....$3.00
The Art of Flying. *Capt. N. Macmillan, M.C., A.C.F.*.....$1.75
The Complete Airman. *Capt. G. C. Bailey*..$5.00

ENGINEERING

Airplane Stress Analysis. *Klemin*.....$7.00
Dynamics of Airplanes and Airplane Structure. *J. Younger & B. Woods*.....$3.50
Elements of Aerofoil and Airscrew Theory. *H. Glauert*.....$5.60
Engineering Aerodynamics. *Diehl*.....$7.00
Fundamentals for Fluid Dynamics for Aircraft Designers. *Dr. Munk*.....$8.00
Principles of Aerodynamics. *Dr. Max M. Munk*.....$1.75
Principles of Flight. *Edward A. Stalker*.....$6.00
Simple Aerodynamics and the Airplane (4th revised edition). *Col. C. C. Carter*.....$4.50
Stresses in Aeroplane Structures. *H. B. Howard*.....$5.00

ENGINES

Aircraft Engine Instructor. *A. L. Dyke*.....$5.00
Aircraft Engine Mechanics Manual. *C. John Moors*.....$4.50
Aviation Engine Examiner. *Major V. W. Page* $3.00
Automobile and Aircraft Engines. *A. W. Judge*. (Revised).....$10.00
Aviation Chart. *Lt. V. W. Page*.....30c
Engine Dynamics and Crankshaft Designs. *Glenn D. Angle*.....$4.00
High Speed Diesel Engines. *Arthur W. Judge*.$4.00
Modern Aviation Engines. *Victor W. Page* (2 volumes), *per volume*...$5.00
Set of 2 volumes.....$9.00
Modern Diesel Engine Practice. *Orville Adams*.....$6.00
Principles and Problems of Aircraft Engines. *Minor M. Farleigh*.....$3.00

FICTION

Night Flight. *A. de St-Exupery*.....$1.75
Sky Larking. *Bruce Gould*.....$2.50
The Right to Solo. *R. W. Kessler*.....$2.00
The Rise and Fall of Carel Banks. *E. W. Springs*.....$2.50
Wender Book of Aircraft. *Harry Golding, F.R.G.S.*.....$2.75

GLIDERS

A B C of Gliding and Sailflying. *Maj. V. W. Page*.....Cloth, $2; paper, $1
The Book of Gliders. *E. Teale*.....$2.50
Gliders and Gliding. *R. S. Barnaby*.....$3.00

HISTORICAL

A Narrative History of Aviation. *John Goldstrom*.....$4.00
Beginning of Organized Air Power. *J. M. Spaight*.....$7.00
Evolution of the Flying Machine. Balloon: Airship: Aeroplane. *H. Harper*.....$5.00
Historic Airships. *R. Sargent-Holland*.....$4.00
Minute Epics of Flight. *Lumen Winter & Glenn Degner*.....$1.00
Sky High. *E. Hodgins & F. A. Mogoun*....$2.50
The Ingenious Dr. Franklin. *Nathan G. Goodman*.....$3.00
The Problem of Vertical Flight. *Parlee C. Grose*.....$1.50
Wings Over Poland. *Kenneth M. Murray*....$3.00

INSTRUMENTS

Blind Flight. *By Maj. Wm. C. Ocker & Lieut. Carl J. Crane*.....$3.00
Instrument Flying. *Howard Stark*.....$2.00
Measurement of Fluid Velocity and Pressure. *J. R. Pannell*.....$4.00

LANDING FIELDS AND AIRWAYS

Air Conquests. *W. J. Davis*.....$3.00

LEGAL AND MEDICAL

Aeronautical Law, with 1933 Supplement. *W. Jefferson Davis*.....$12.50
Aircraft and Commerce in War. *James M. Spaight*.....$2.25
Aircraft and the Law. *Harold L. Brown, LL.B.*.$3.00
Aircraft Law—Made Plain. *George B. Logan, A.B., LL.B.*.....$3.00
Aviation Law. *Henry G. Hotchkiss*.....$7.50
Law of Aviation. *Rowland W. Fixel*.....$7.50
National Regulation of Aeronautics. *Chas. C. Rohlfing, Ph.D.*.....$3.00
The Law in Relation to Aircraft. *L. A. Wingfield, M.C., D.F.C., & R. D. Sparks, M.C.*.....$5.00
U. S. Aviation Reports, 1932.....$10.00
Aviation Medicine. *L. H. Baner, M.D.*.....$7.50

MATERIALS

The Materials of Aircraft Construction. *F. T. Hill*.....$5.00
Manufacture and Use of Plywood and Glue. *B. C. Boulton*.....$2.25
Metallurgy of Aluminum and Aluminum Alloys. *Robert J. Anderson*.....$7.50
Engineering Materials (Vol. 1) Ferrous. *A. W. Judge*.....$8.50
Engineering Materials (Vol. 11) Non-Ferrous and Organic Materials. *A. W. Judge*.....$7.50
Engineering Materials (Vol. 111) Theory and Testing of Materials. *A. W. Judge*.....$6.00

METEOROLOGY

Aeronautical Meteorology. (Revised edition.) *W. R. Gregg*.....$4.50
An Analysis of Meteorology. *Harold Lewis Kirby*.....$4.00
Cloud Studies. *A. W. Claydon, N. A.*.....$4.50
Force of the Wind. *Herbert Chatley*.....$2.00
Man and Weather. *Alexander McAdie*.....$2.00
Meteorology for Aviator and Layman. *Richard Whatham*.....$3.00
Weather. *E. E. Free and Travis Hoke*.....$3.00
Weather and Why. *Capt. I. E. Elm*.....$2.50

MODEL AIRPLANES

Beginners' Book of Model Airplanes. *C. H. Claudy*.....$1.75
Building and Flying Model Aircraft. *Paul Edward Garber*.....$2.25
Complete Model Aircraft Manual. *Edwin T. Hamilton*.....$3.50
Miniature Aircraft. How to Make and Fly Them. *O. H. Day & T. Vincent*.....80c
Model Airplanes. *Joseph Ott*.....$2.50
Prize Winners' Book of Model Airplanes. *C. H. Claudy*.....$3.00
The Skycraft Book. *Laura B. Harney*.....$1.25

NAVIGATION

Aerial Navigation & Meteorology. *Lewis A. Yancey* (new edition).....$4.00
Aircraft Radio. *Myron F. Eddy*.....$4.50
Air Navigation and Meteorology. *Capt. Richard Duncan, M. C.*.....$3.00
Air Navigation for Private Owners. *F. A. Swoffer, M.B.E.*.....$2.25
Avigation by Dead Reckoning. *Captain Lenar E. Elm*.....$2.00
Line of Position Book. *Lt.-Com. Weems*..$2.50
Simplified Aerial Navigation. *J. A. McMullen*.....$2.00
Simplified Time-Chart of the World. *Chas. M. Thomas*.....25c
The Navigation of Aircraft. *Logan C. Ramsey* $4.50
The Navigation of the Air and Meteorology. *Capt. Leslie Potter*.....$4.00

PARACHUTES

Jump. *Don Glassman*.....$3.00
Parachute. *Charles J. V. Murphy*.....$2.50
Parachutes for Airmen. *Chas. Dixon*.....$2.50

PHOTOGRAPHY

Aerial Photographs. *Lt. Reeves, A.C.*.....$5.00
Airplane Photography. *H. B. Ives*.....$4.00
Applied Aerial Photography. *Capt. Ashley C. McKinley*.....$5.00
Multiple Lens Aerial Cameras in Mapping. *Fairchild Aerial Camera Corp.*.....$5.00

TRANSPORT and COMMERCIAL AVIATION

Economics of Air Mail Transportation. *P. T. David*.....$2.00
An Introduction to the Economics of Air Transportation. *Kennedy*.....$2.00
Principles of Transportation. *E. R. Johnson, Ph.D., Sc.D.; G. G. Huebner, Ph.D., and G. L. Wilson, Ph.D.*.....$5.00
Transport Aviation (2nd Edition). *Archibald Black*.....$4.00

YEAR BOOKS

Aircraft Year Book 1934.....$3.00
All the World's Aircraft. 1933—*Jane's*.....$14.75

All Prices Include the Postage

AERO DIGEST • 515 Madison Avenue • New York

Remit by Money Order or Check

ADVERTISERS' LITERATURE

THIS service is for the convenience of those who are in the market for any of the products or facilities advertised in this issue. Read carefully the advertising of the items in which you are interested, to determine whether the information offered is what you need. When filling out the coupon be sure to mention the company with which you are associated, and your position.

AIRCRAFT

1. The Aeronca, 2-place light plane, is completely described and illustrated in the new literature for dealers, private owners, etc.....Page 63

2. The Boeing 247 transport's literature is available to airline executives and other American and foreign users of large aircraft .....Page 39

3. The "Luxury Airliner," by Douglas, is described in a booklet for airline officials and other operators of high-speed large payload aircraft..Page 33

4. Private fliers and commercial operators are invited to write for literature describing the new Stinson "Reliant" and its "Selectiv-glide" speed arresters .....Page 59

5. Waco's popular line of open and closed aircraft is interestingly described and illustrated in a booklet prepared for private fliers, dealers, operators, business houses, etc...Page 61

6. Dealers, operators, private fliers — Fairchild introduces a new 3-place cabin job, powered with a Warner Super-Scarab. Write for the latest descriptive literature..Page 52

7. Purchasers of new aircraft for commercial or private flying — secure a copy of the literature describing the modern Beechcraft.....Page 49

8. Dealers, fliers: Monocoupe has a new model and invites you to write for the illustrated literature describing it..Page 51

9. Descriptions of the Consolidated line of military aircraft are available to Army and Navy officials of the United States and foreign governments .....Page 7

10. The Taylor two-place plane, winner of the light plane race in Miami, January, 1934, is described for dealers and potential plane owners.....Page 55

ENGINES

12. Aeronautical engineers, mannfacturers, operators and government officials write for the P. & W. booklet. 2nd Cover

AIRCRAFT AND ENGINE EQUIPMENT

13. Aeronautical engineers concerned with insulating problems are urged to write for a copy of The Felters Co. literature on the use of felt in aircraft .....Page 36

14. Aeronautical engineers, manufacturers and operators to whom accuracy is the watchword will appreciate the Kollsman Instrument catalog describing Kollsman precision instruments .....Page 1

15. Berry Bros.' literature describes aircraft finishing problems, colors, etc.....Page 36

16. Before purchasing new aircraft spark plngs write for the B. G. booklet.....Page 2

17. Aircraft manufacturers, engineers, dealers—write for the literature describing Wellington Sears fabric.....Page 59

18. Manufacturers, base managers, repair stations, keep a copy of the Wittek hose clamp literature handy .....Page 59

19. Engineers, manufacturers: Fleetwings is equipped with a complete shot-welded system of stainless steel construction. Page 59

20. Aircraft manufacturers, operators, dealers—write for a copy of the Eclipse Starter and Generator literature. Back Cover

21. Airplane and engine manufacturers, operators, dealers, pilots — an interesting folder describes the Evans fuel pump which is enjoying popular nse here and abroad.....Page 57

22. Aircraft manufacturers, engineers, snpply houses — you are invited to write for National Tube Company's catalog of high grade aircraft tubing. Page 49

23. Pilots, manufacturers and operators are urged to write for Nicholas-Beazley's complete catalog of aeronautical supplies .....Page 55

24. Engineers, aircraft and engine manufacturers—the story of accurate, dependable roller and ball bearings is told for you in the S K F catalog. Page 25

25. Engine manufacturers, repair stations, dealers—do you have the literature describing Thompson Valves? 3rd Cover

MISCELLANEOUS

26. Engineers, pilots, mechanics, students — The Ronald Press library will broaden your knowledge of technical aeronautics. Write for a list of the various Ronald Press aviation books .....Page 72

27. To airport commissions, municipalities, etc., American Sheet & Tin Plate Co. will gladly send their literature on hangar construction...Page 63

28. The Westport ground and aircraft radios are distributed by Pacific Airmotive Corp., Ltd. .....Page 50

SCHOOLS

29. The Boeing School of Aeronantics literature will be helpful to those who contemplate a course in aviation...Page 51

30. Secure a copy of the Tri-State College catalog of aeronautical engineering...Page 68

31. "Three Star Training" is described for students-to-be, by the Spartan School....Page 43

32. Roosevelt Aviation School, has an interesting story to tell. Page 55

33. Inter City Airlines, only government approved school in New England, urges pilots-to-be to write for their curriculum of courses, prices, etc. Page 68

34. Dallas Aviation School invites those who contemplate flight or ground-training to write for booklet.....Page 5

35. For ground or flight training write to Ryan School of Aeronautics .....Page 61

36. Boeing School of Aeronautics offers new Home Study courses .....Page 63

37. "Skyward Ho!" is the title of the Parks Air College catalog .....Page 3

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number

CHECK HERE: Name .....

No. ..... Position .....

No. ..... Company .....

No. ..... Address .....

No. ..... City and State 7-34

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

RIEKER BANK INDICATORS

Made to U. S. Air Service specifications

Descriptive circular sent on request.
RIEKER INSTRUMENT COMPANY
1919 Fairmount Avenue Philadelphia, Pa.

STAINLESS STEEL TIPPED PROPELLERS

FLOTTORP PROPELLER CO.
1836 Linden Ave., S.E.
Grand Rapids, Michigan

UNIVERSAL PROPELLERS

APPROVED TYPES

Special price on few test props, $24.50; used K-5 Hartzell, OX-5 and Velie M-5. All guaranteed in perfect condition.

UNIVERSAL AIRCRAFT SUPPLY CO.
2300 N. 9th Street St. Louis, Mo

STREAMLINES

Cowlings and Wheel Pants

Metal Spinning, Sheet Metal Specialties
HILL AIRCRAFT STREAMLINERS CO.
814-16 Reedy St. Cincinnati, Ohio

AERO BLUE BOOK

gives specifications of over 350 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Also present second-hand market value of popular ships. Only information of its kind ever compiled. Almost priceless to students, engineers, dealers and flyers. Complete, only. . . $1.00 postpaid.

NATIONAL DISTRIBUTORS,
922 Pine St., St. Louis, Mo.

selected clear aero sitka SPRUCE

For quick shipment from Chicago, rough or finished to exact size. For airplanes, gliders, iceboats, etc.

Lowest Wholesale Prices

Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.

Come to Us for Good Spruce

PIKE-DIAL LUMBER CO.
Airplane Lumber Specialists—2251 Loomis St., Chicago
We also carry "Plycor" aircraft plywood

Landplane Airports, Seaplane Airports, Design, Supervision of Construction, Management Counsel, Transport Studies

A. P. TALIAFERRO, JR.* & COMPANY, INC.

Airport and Air-Transport Consultants and Engineers
101 PARK AVENUE, NEW YORK

*Formerly Chief of Airport Section, U. S. Department of Commerce, Washington.

SELLING THE PRIVATE FLIER

AIRCRAFT manufacturers are introducing new models . . . new aircraft companies are forming every month . . . some manufacturers are working three shifts a day in order to equalize production and sales. Most of them are manufacturers of two- and four-place planes, proving the growth of the private flying market. If you have a used plane to sell, an accessory, etc., it will pay you to make a special play for the private flier's attention. You can do it economically in THE SPORTSMAN PILOT, only magazine devoted 100% to the sportsman flier. Space in the "On the Market" department costs only $5 per column inch.

Further details on request.

THE SPORTSMAN PILOT
515 Madison Aveoue, New York, N. Y.
Phooe: PLaza 3-6969

MAGNETOS!

We have complete Stocks of SCINTILLA mags and parts at absolutely lowest prices!

Coils—Points—Cams—Gears

Supply Division, Inc.
Robertson, Missouri

Research
Design
Stress-Analysis

Manufacturing
Flight-Testing
Operations

GRANVILLE, MILLER & DE LACKNER
CONSULTING
AERONAUTICAL ENGINEERS
SPRINGFIELD AIRPORT, SPRINGFIELD, MASS.

Phenix Clear Nitrate Dopes

Clear — $1.05 per gal. in 50 gal. Drums Included
— $1.10 per gal. in 30 gal. Drums Included
— $1.20 per gal. in 5 gal. boxed cans
Pigmented—$1.90 per gal. in 5 gal. boxed cans
Yellow, Blue, Green, Cream, Khaki, Aluminum, Black, White. Immediate shipments fresh high grade.
"Send ½ the cost with C. O. D. shipments"
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

"INSTRUMENT FLYING"

By Howard Stark

80 pages. 25 illustrations. Flexible cover.

$2.00 postpaid.

A method of locating the radio beacon station.

James Stark, Pawling, N. Y.

KEEP YOUR COPIES OF AERO DIGEST IN A BOUND VOLUME

Attractive and durable binding at special rates to AERO DIGEST subscribers

MANHATTAN BOOKBINDERY
240-242 W. 23rd St., New York, N. Y.
Phnoe CHelsea 3-7204

AIRCRAFT FINISHES

Our Aircraft Finishes are nnt excelled io QUALITY, DURABILITY nr ECONOMY. Backed by years nf satisfactnry experience, their use iosures the eod nf complaints. Our line is cnmplete. We nffer a fioish fnr every purpnse. Write fnr nur prices. They are sure tn interest ynu.

DIBBLE COLOR COMPANY
1497 East Grand Blvd., Detroit, Michigan

PATENTS—TRADE MARKS

All ioveotinne submitted held enofideotial and given persnoal atteotino by membere nf the firm.

Fnrm "Evidence nf Cnnceptinn" and instructinns

"Hnw tn Estnblish Ynur Rights"—Free

LANCASTER, ALLWINE & ROMMEL
PATENT LAW OFFICES
472 Bnwen Bldg. Washingtoo, D. C.

FOR SALE

MISCELLANEOUS
51 Airplanes
20 Engines
Lights—landing, navigation
Fuel Pumps
Generators G1-G2
Oil and Fuel Line Fittings
Oil Reclaimers
Safes
Parachutes
Instruments
Starters and Parts
Propellers and Parts
Plywood (3-Ply Birch)

Aircraft Cable
Radio Receivers
Radio Parts R.C.A., W.E., S.C.
Paint, Varnish, Lacquer, dope, etc.
Tools and Shop Equipment

AIRPLANE PARTS
Stinson Parts—Model "S" Jr., SM1-D, SM6-B, SM6000-B
Ford Airplane Perts—5 AT
Fokker Parts—S.U. and F10A
TravelAir Parts—(Model 4000)
Stearmen Perts—(C3B-C3MB-4CM1-LT1)
Pitcairn Parts—(PA5-6-7)
Fairchild Parts—(FC2-FC2W2-71)
Bellanca Pecemaker Parts
Pilgrim Perts—(100A and 100B)

ENGINE PARTS
Wright Engine Parts—J-6-5, 7, 9 and J-5 Cyclone E, Glnsv
P & W Engine Perts—Wasp B & C-Wasp Jr. Hornet A-A1-A2-B-B1-C
Klnnor Engine Parts—K5-B5-C5
Ignition Harness—Shielded & unshielded
Spark Plugs
Magnetos and Perts
Carburetors and Perts

This is not a complete list. Additional equipment is being constently received. Descriptive price lists mailed immediately upon request covering class of stock in which you ere interested. Reasonable prices. New engine parts 50% off list—used parts 60% off list.

ALL BONA FIDE CASH ORDERS WILL BE CAREFULLY CONSIDERED
Please order by part number where possible.

AMERICAN AIRWAYS, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

MAX M. MUNK

Registered Patent Attorney

Grad. Mech. Engineer
Doctor of Engineering
Ph.D
Member Virginia Bar
Technical Author

Rendering professional service of highest standard to government and private parties here end ebroad since 1915.

1734 Eye St., N. W. Washington, D. C.

Royal E. Burnham

Attorney-at-Law

Patent and Trade Mark Causes

511 Eleventh St., N.W., Washington, D.C.

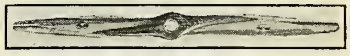
BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

San Fernando & Raymond - - Glendale, Calif.
LIEUT. W. G. HAWKINS
AIR-PARTS 70-85% OFF
A DEPENDABLE COMPANY

All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velle, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

A COMPLETE LINE
TITANINE
THE WORLD'S PREMIER
DOPE
TITANINE, INC.
MORRIS & ELMWOOD AVES.
Union, Union Co., N. J.



BIRCH AND WALNUT PROPELLERS
Good performance - Accurate design - Tested materials - Guaranteed finish - FAIR PRICE!
Marshall Propellers for all engines up to 165 h.p.
Manufactured by
MIDWESTERN AVIATION CORPORATION
Seymour, Indiana

AERONAUTICAL RADIO CO
ROOSEVELT FIELD MINEOLA N. Y.
Telephone Garden City 6770
Radio Shielding for all types of motors.
Western Electric Aircraft Radio
Hurley-Townsend Radio-Shielded Plugs
Westport Aircraft Radio Transmitting Equipment

N. A. C. A. Cowling Specialists
METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter
MAGOSY & BUSCHER
120-126 Walker Street New York, N. Y.

ENGINE PARTS CHEAP
WASP: Cams, $25; cam reduc. gear, $20; link rods, $8; master rods, $75; pistons, 6:1, $5; starter jaw, $10; blower impeller shaft, 10:1, $25; impeller, $25; 14:1 blower assem., $100, etc. **J-5:** Crankshafts, $50; main crankcase, $75; intermediate, $35; cylinders, $18; oil pump, $25, etc. **HORNET A** cylinders, $30; link rods, $8; master rods, $75; valves ex, $7.50; intake, $5; etc. **CYCLONE** cams, $25; con rods, $8; blower parts, valves, rocker arms, etc.
Large Assortment Wheels, Starter, Instruments, Etc.
DYCER AIRPORT
9401 So. Western Avenue Los Angeles, Calif.

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

EAGLEROCKS FLYABOUTS
Two time-proven ships
Flyabout with Continental 37 h.p., A. T. C. No. 439, $1,465
Flyabout with Szekely 45 h.p., A. T. C. No. 449, $1,590
Eaglerock prices on request. Dealers wanted.
See classified section for bargain list of used planes, surplus materials and repairs.
AIRCRAFT MECHANICS, INC.
Colorado Springs, Colorado

ENGINE BROKERS
Hangar "B," Roosevelt Field, Mineola, N.Y.
FOR SALE
Completely overhauled engines. 2 165 Whirlwinds, $300-$400. 2 J-5's, $250-$400. 2 Continentals 165, $300-$400. 1 J6-7, D type, $900. 1 J6-9, D type, 150 hours since new, with electric starter and generator. 2 Wasp B's. 3 Challengers. $200-$400.
Parts and Accessories Bought and Sold
DON WALLING W. W. WIELAND

WACO AIRPLANES
FOR SALE
EXCEPTIONAL BUY: 1934 225 h.p. Jacobs Waco Cabin. Wheel pants, landing lights, electric flares, turn and bank, steel prop. Total time, 30 hours. Many others, including Wacos, Monocoupes, Birds, etc.
ERICKSON & REMMERT
Hangar 6, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-2100

Detroit Aero Motors Co.
14019 Hamilton Ave., Highland Park, Mich.
FOR SALE—AIRCRAFT ENGINES: Warners, 110 h.p., $300; Continentals A70-1, 165 h.p., $350; Continentals A70-2, 165 h.p., $500; Wright J-5's, 220 h.p., $350; Wright J6-5's, 165 h.p., $350; Lycoming R-680, 210 h.p., $500. All above motors have just been reconditioned.
WE BUY AND SELL AIRCRAFT ENGINES
Write for lowest prices on Standard dope and fabric.

AERO BROKERAGE SERVICE COMPANY
E. L. ERICKSON
LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA
"Selling the World Over"

Write for our New Low Prices on used Airplanes, Motors and Parts for all aviation engines.

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale
The Vimalert Company, Ltd.
835 Garfield Avenue, Jersey City, N. J.

For Sale: Certified Used Ships
All ships licensed. Excellent condition. Trade or terms to responsible parties.
WACO SALES
OF NEW YORK, INC.
Hangar 16, Roosevelt Field, Mineola, N. Y.
N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

TRADE IN YOUR OX-5
for a
TANK ATC 73, 115 h.p.
V-8 AIR COOLED ENGINE
$395
and your OX-5, f.o.b. Milwaukee
MILWAUKEE PARTS CORPORATION
607 So. Sixth St., Milwaukee, Wisc.

ENGINES
PARTS AND ACCESSORIES BOUGHT—SOLD
Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasco, etc. Also starters, generators, propellers, instruments, wheels and parachutes.
WRITE FOR PRICE LIST FRANK AMBROSE
AERO SALVAGE CO.
Glenn Curtiss Airport, Jackson Heights, N. Y.

AIRPLANES FOR SALE
AVAILABLE FOR IMMEDIATE DELIVERY

23 Lycoming Stinson Trimotors	Big Springs, Cleveland, Tulsa, Dallas, Fort Worth, Nashville, Memphis, Chicago, Detroit, Albany	$4,500 to $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit	8,500
4 Wright Cyclone R1820E Pilgrims	Chicago, Cleveland, Albany	8,500
2 Wright J-6-9 Bellanca Pacemakers	Cleveland	4,000
2 Wright J-6-9 Stinson SM1-D	Cleveland	2,500
3 Wright J-6-9 Stearman 4CM1	Fort Worth, Cleveland, St. Louis	5,000
5 Wright J-5 Duals Stearman C3-MB	Glendale, Cleveland, Fort Worth, Newark, Dallas	1,500

THIS AIRCRAFT is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.
CASH OFFERS are requested to include newly overhauled engines installed and "NC" License. In the event of export, all such shipments of aircraft will be covered by Export Airworthiness Certificates. UPON REQUEST we will quote C.I.F. any desired Seaport or D.D.F. where now located.
Photographs to responsible buyers.
ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED
AMERICAN AIRWAYS, Inc., Sales Div., Municipal Airport, Cleveland, Ohio
Branch Office—Sales Division, 45 Vanderbilt Ave., New York City.

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

Pacific School of Aviation

All Flight Instruction Under Personal Supervision of

LT. JIM GRANGER

at Clover Field — Santa Monica, California

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS

Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering.

NEW YORK UNIVERSITY

UNIVERSITY HEIGHTS, NEW YORK, N. Y.

AERONAUTICAL ENGINEERING

DEGREE IN 2 YEARS

Become an Aeronautical Engineer. Tri-State College course given in 108 weeks. Bachelor of Science degree. Graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Thorough training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Non-essentials eliminated. Courses designed to save student time and money. Flying school facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter September, January, March, June. Courses are offered also in Civil, Architectural, Electrical, Mechanical, Chemical, Radio Engineering; Business Administration and Accounting. Living costs and tuition low. Those who lack high school may make up work. World famous for technical 2-year courses. Graduates successful. Write for catalog.

1074 COLLEGE AVE., ANGOLA, IND.

TRI-STATE COLLEGE

LEARN FLYING IN AN APPROVED SCHOOL

- Instructors, ships, facilities and field are approved by the United States Department of Commerce only after rigorous examination.
- Ground and flying instruction is based on a regular schedule—arranged to assure maximum results in a minimum of time.
- Students qualify for Department of Commerce licenses with less flying time—a saving in costs.
- Courses include thorough ground instruction as well as flying.

Write for Complete Details and Costs

INTER CITY AIRLINES, Inc.

BOSTON MUNICIPAL AIRPORT EAST BOSTON, MASS.

Operating the Only Approved Flying School in New England

Learn a Trade Protected by the Govt.

CASEY JONES SCHOOL OF AERONAUTICS, Inc.

558 BROAD STREET, NEWARK, NEW JERSEY

- One- and two-year courses in Master Mechanics and Aeronautical Engineering

FOR THE PILOT- AND MECHANIC-TO-BE

IN this issue of AERO DIGEST appears the advertising of the following schools: Boeing, Dallas, Parks, Roosevelt, Ryan, Spartan, N. Y. U., Pacific, Tri-State, Casey Jones and Inter City Airlines—located from coast to coast.

Their aim is to train you—thoroughly. So that you may make a preliminary study of their ability to do so before you enroll, they have published catalogs listing their facilities, curricula of courses, rates, etc. You are urged to write for them.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

$425 TAKES excellent straight-axle Velie Monocoupe. Recovered, metal belly, compass. Clean-running motor. Fine shape. Licensed. Details for stamp. Raymond Hegy, Loyal, Wisconsin.

WILL SELL my Travel Air J-5 4000 airplane. Ship in good condition. Asking $1,200; make me an offer. Mrs. C. Eckert, 103-14 Ninety-Fourth St., Ozone Park, L. I., N. Y.

TAPER WING WACO: J-5 Wright. Completely recovered; speed ring, navigation light, starter, compass; motor 19 hours since major overhauled; never cracked up. Price $1,750. Descomb, 263 Victoria Road, Hartford, Connecticut.

AMPHIBIONS, INC. J-6 330 five-place cabin amphibion, now being overhauled and relicensed; and AMPHIBIONS, INC. open flying boat five-place. Furnish NC licensed with Wasp Senior or J-6 330 engine; large stock spare parts, including handling dolly. $5,000 cash takes everything. AERO DIGEST, Box 1810.

CHALLENGER 185 h.p. Eaglerock: Just relicensed. Excellent condition. Engine major overhauled. Good looker, better performer. Landing lights. $995. Cy Gates, Curtiss Airport, East St. Louis, Illinois.

ROBIN: New type Challenger 185; just recovered. For quick sale, $785. Also pontoons for Robin. Robert Stieber, Albert Lea, Minnesota.

AERONCA SCOUT: Licensed until June '35. New covering, new propeller, new motor. A bargain, $325. B. Fairchild, c/o The Palace, Monroe, La.

LAIRD J-6-9: 330 h.p. (modernized). Top 175, cruises 140, climbs 1650. Townend ring, pants, semi-airwheels and brakes, oil radiator, front cockpit cover; complete instruments, including rate of climb, turn and bank and earth inductor compass. Finished silver, trimmed red and black. All struts and wires chromium. Only 390 hours, 190 since major. Never cracked. $2,000, cash; no trades. Photographs if you mean business; photo collectors kindly ignore this. AERO DIGEST, Box 1811.

LATE '33 WACO cabin: 100 hours total, ship and engine; many extras; ship like new. For information, call William Howell, Flushing Airport, Flushing, New York.

CESSNA J6-9 330: 4-place cabin; 150 hours since major overhaul and recovering. Best looking and fastest ship in Northwest. Best offer over $2,000 gets ship. Boote's Hatchery, Worthington, Minn.

BELLANCA PACEMAKER: J6-9; completely recovered and reconditioned; a beautiful job, looks like new, and a bargain; $4,250. Curtiss-Wright THRUSH: J6-7; 6-place, major overhauled and recovered; licensed for a year, $1,650. Travel Air 6000, J-5, little time, $1,150. Travel Air 4000, J6-S, in fine condition, $1,350. OX-5 Travel Air, stressed for J-S, $500. LeBlond Arrow Sport, $550. Hisso Eaglerock, $350, Velie M-5 Lyon 2-place monoplane, $365. Come and inspect these bargains. Hoosier Airport, Inc., Indianapolis, Indiana.

AERONCA 2-PLACE: Rehuilt like new. Will accept plane needing repair or late automobile as part payment. Write for particulars. McCoy's Aircraft Service, Napoleon, Ohio.

WACO 10 OX-5: Licensed, in excellent condition. Navigation lights, hooded cockpit for instrument flying. Compass, turn and bank, air speed, pitch indicator. Never cracked, always kept in hangar. $400. Ming, R. F. D. 1, Box 40, Red Bank, N. J.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

TRAVEL AIR 4000: J-5; Heywood starter, air wheels, brakes and in perfect condition. Aeronca 2-place. 2 Eaglerocks. Waco F parts. Sell or trade. Crane Garage, Toledo, Ohio.

STINSON MODEL R: Cannot be told from new. Very few hours due to illness of owner. Will sacrifice for quick sale. Will accept trade. Price $2,950. H. W. Bresee, 650 S. Salina St., Syracuse, N. Y.

FOR SALE: OX-5 center section Eaglerock. Needs covering. $125, cash. Ralph Hopkins, Redfield, South Dakota.

AUTOGIROS: 2-place side-by-side KELLETT, 210 h.p. Continental. Demountable cabin. Excellent condition throughout; total engine time only 70 hours, ship time, 150 hours. Best care, always hangared. Licensed to August. Priced right for quick sale. 3-place PCA-2 PITCAIRN, 300 h.p. Wright. Good flying condition. Approximately 600 hours total time. Licensed. Reasonable. Kellett Autogiro Corp., 717 Atlantic Building, Philadelphia, Pennsylvania.

WACO J6-5: Like new; steel propeller, airspeed, recently reconditioned for $1,500; snappy color. See this airplane. Only $1,600; terms if desired. H. A. Ecker, Airport, Syracuse, New York.

TRAVEL AIR J-5: Newly recovered, upholstery new, steel propeller, motor and ship in A-1 condition throughout. Will sell with or without motor. or will accept airplane or car in trade. Floyd Becker, Grand Rapids, Michigan.

CURTISS JUNIOR: NC 11841. Few hours, always hangared. For inspection or further information call Christie Airport, New York City, N. Y. Price, $250 cash.

AUTOGIRO: Pitcairn, PAA 1 model, 250 hours, 100 since overhaul, licensed and in first-class condition; Kinner 125 h.p. motor, Heywood starter compass, bank indicator, air speed indicator, cockpit covers, steel propeller, semi-air wheels and brakes, always hangared. $1,200 cash, no trades, for immediate sale. Walter Kemp, Westchester Airport, Bedford Road, Armonk, New York. Armonk 307.

TRAVEL AIR: 3-place; 125 h.p. Siemens. Hamilton steel propeller. Wings recovered. Motor major overhauled. Just relicensed. $800. Lee Darby, 108 William St., East Orange, New Jersey.

HIGH SPEED Monocoupe: Excellent condition, 125 Warner. Pants, Townend ring, brakes, complete blind flying instruments, drift indicator; high gloss finish; steel propeller. $1,200. Adolph Kastner, 1698 Edmund Terrace, Union, New Jersey.

BOEING "95": $1,250. Boeing 40-B, $1,500. Fokker Super-Universals: Engines majored, ships licensed, good condition. Each, $1,650. Charles Babb, Grand Central Air Terminal, Glendale, California.

TANK WACO: Motor factory overhauled, ship just covered International orange, wings silver. Steel prop and compass. Best offer. OX TRAVEL AIR: One wing slightly damaged, no spars cracked, needs covering; $125 takes it. Douglas Harris, Waverly, Iowa.

FOR SALE: 1933 Waco Cabin, 210 Continental, 350 hours. 70 gal. tanks, bank and turn. rate of climb. Excellent condition. $4,000 cash. Lloyd O. Yost, "Starhaven," Middletown, New York.

KINNER-POWERED short nose American Eagle: Perfect condition. Steel prop, air wheels, special paint job. Bargain at $1,050. Philip Miraglia, 208 Irvington Drive, Tonawanda, New York.

CURTISS ROBIN: Challenger motor with electric starter; 24 hours since major engine overhaul; just completely recovered; excellent condition, Jane W. Willis, 419 E. First St., Hinsdale, Ill.

FOR SALE: Hisso 180 h.p. Travel Air biplane, with two motors; new covering, new motor in ship, spare motor in perfect shape. Great ship for stunting, inverted flying and banner towing work. Bargain. Bob Trader, Bettis Airport, Dravosburg, Pennsylvania.

AERONCAS: Due to demand for the new improved 1934 Aeronca, have several trade-ins available. These ships are in excellent condition; manufactured during 1933; have the latest type enlarged cockpit; are equipped with oleo landing gear and winter enclosure. Detailed list will be furnished immediately upon request. Aeronautical Corporation of America, Lunken Airport, Cincinnati, Ohio.

OXX-6 SWALLOW: 3-place; excellent condition; less than 100 hours since major overhaul; $350. Steven Hay, Air City, Sturtevant, Wisconsin.

TRAVEL AIR TRAINER, with Warner 125. Ship in very good condition. Special paint job, navigation lights, air speed, balloon tires, brakes, steel prop, ring, etc. $1,250. J. W. Farly, Albany Airport, Albany, New York.

FLYING BOAT, AMPHIBION: For sale cheap. Ireland J-5 4-place amphibion; Challenger-Eastman flying boat; both rebuilt and licensed. Also cracked Eastman. Johnson Airways, New Orleans, La.

FOR IMMEDIATE SALE: Three new Pitcairn Mailwings, practically complete, less cover and engine installation. Also parts to assemble two additional ships, plus large stock of spares. Design approved for J-5 or 7-cylinder J-6 Wright, to carry 2 passengers or 600 pounds of mail. Any reasonable offer will be considered for all or part of the above. Pitcairn Autogiro Company, Willow Grove, Pennsylvania.

PRIVATEER AMPHIBION, less motor; with steel prop, Heywood starter; extra set wings, tail surfaces, etc.; former owner Department of Commerce; 270 hours; excellent condition; $1,100. New York. AERO DIGEST, Box 1826.

LOW-WING MONOPLANE: N-B 4, series 2, with Warner 110. 3 POLM; brand new, total 14 hours; 120 m.p.h. Semi-air wheels, brakes, Aerol struts, all-metal structure throughout. Hottest plane ever built for barnstorming tight fields. Also W-W J6-5, 97 hours. New type, with clutch, etc. Must sell. E. W. Oliver, 1511 Hyde Park Boulevard, Chicago, Illinois.

FOR SALE: Menasco, Warner, Cirrus and Gipsy Fairchild 22's. Stinson R, Stearman Wasp, Laird Wasp, Bellanca Wasp, Waco C, Lambert Coupe, Warner Coupe, Loening Commuter, Kinner Fleet, Cessna Warner, Fledgling, Aeronca, Waco Taperwing, Lockheed Sirius, Challenger Robin, Inverted Cirrus motor and metal propeller. Aeronca motor, pontoons and parts. Aircraft Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

FOR IMMEDIATE SALE OR EXCHANGE: 16 certified airplanes, as follows: J-5 Waco seaplane, fully equipped with Edo floats and Heywood air starter, condition like new throughout. J6-9 330 h.p. straight wing Waco; Kinner 100 h.p. Fleet: J-5 B-1 5-place Ryan, excellent condition: J6-7 250 h.p. taper wing Waco; J6-5 175 h.p. Curtiss Robin, cabin ship; 2 J6-9 330 h.p. 6-place Travel Air cabin ships; J6-9 330 h.p. 6-place Stinson cabin ship; J-5 3-place Travel Air, late type; Lycoming-powered Stinson Junior; OX-5 type 2000 Travel Air; Velie 65 h.p. Monocoupe; J-5 Waco: J-6 B-5 6-place Ryan; Wright Cyclone-powered 20 passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean business. Will accept good late model cars on deals. Terms to responsible buyers. Buy now before prices advance. Becker-Forner Flying Service, Inc., Jackson, Michigan.

AERONCA: NC11492. two-place; less motor, wheels and instruments. $325. Ship excellent condition. Has 250 hours, new windshields and control cables. Looks like new. Louis Egger, Woodsfield, Ohio.

HEATH BULLET: $165, incomplete. Wings, fuselage, tail surfaces. $75 to finish plane, less motor. prop. Built by Haldeman, trans. flier, approved shop. Cost $600 to build. Box 124, South Lancaster, Massachusetts.

WACO 125: Siemens-Halske 9-cylinder radial. 250 hours on ship, 150 hours on motor, 10 hours since overhaul. Ship and motor in A-1 condition. just relicensed. Air wheels and steel prop, with adjustable blades. Color: fuselage, cream; with green cowling and red wings. A real buy at $895. Spare motor for parts. A. A. Meyer, Meyer's Service Station, Massillon, Ohio.

WHITTELSEY AVIAN: Cirrus III. $600 cash; small repair; or trade for seaplane. Irving parachute, $125. George du Manoir, 209 Morris Avenue. Spring Lake, New Jersey.

CESSNA: 4-place J6-7 D; Savoia amphibion, Kinner 125 h.p.; Crescent 8-place J6-9 E; Buhl Bull Pup; Stearman J5; Fairchild 51 on floats; several others. Chuck O'Connor, Barnes Air Service, Westfield, Massachusetts.

WACO J-5: In excellent condition, air starter, steel propeller, Pioneer landing lights and complete night equipment. Sell with or without motor. Will accept plane or car in trade. Central Air Service, Grand Rapids, Michigan.

TRAVEL AIR 6000: Completely rebuilt and repainted. Excellent condition throughout. Fully equipped for night flying. Has Wright 330 engine, completely modernized by Wright company. Holds six, hut can be licensed to carry 7. $1,650. J. W. Farly, Albany Airport, Albany, New York.

FOR SALE: Waco 90, licensed, new fabric, fine condition; $375. Robbinsdale Airport, Minnesota.

BUHL BULL PUP: 45 h.p. Szekely; 10 hours since top overhaul. Licensed until May '35. Cheap for cash; consider late model car or another ship. M. F. Digley, 1104 Avenue J, Lubbock, Texas.

SAVOIA MARCHETTI Amphibion: 3-place, Kinner K-5 motor, Heywood starter, standard instruments, 300 hours, just relicensed; $1,200. R. G. Schmitt, 2914 Washington, St. Louis, Missouri.

STRAIGHT WING WACO: J-5; A-1 condition; zero hours since completely recovered and major overhaul on engine. Just like new. $1,600. F. Page, 6236 S. Parkside Avenue, Chicago, Illinois.

WACO F: 1931 Model; Warner 125, A-1, starter; steel propeller, brakes, tailwheel, navigation lights, battery, licensed to July 1935. Complete instruments. $1,495. AERO DIGEST, Box 1813.

TAPERWING WACO: J6-7; perfect condition; plenty of extras; privately owned; licensed to June 1935; accept any reasonable cash bid or trade. AERO DIGEST, Box 1815.

100 AIRPLANES: $80 up, flyaway. Repairable crackups, $30 up. Send 20c for complete list with owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

FOR SALE—J6-9 330 h.p. 6-place Stinson cabin ship. Excellent condition throughout. No reasonable offer or proposition refused. Terms to responsible buyers. Michigan Aero Motors, Jackson, Michigan.

COMMAND-AIRE: Axelson 150 h.p. Perfect condition. Licensed. Hamilton steel propeller; Bendix wheels and brakes; beautiful finish; duals, navigation lights, extra instruments; economical to operate; 500 miles cruising range. Bargain, $1,000 cash. Williamsburg Flying Service, Williamsburg, Kentucky.

FAIRCHILD 22: Hi-Drive Cirrus; ship and motor in excellent condition; $1,500. MONOCOUPE: 125 Warner with racing cam; full N A C A cowl; wheel pants; $1,750. WACO CABIN: 210 Continental, used only 100 hours; RCA radio; bank and turn, rate of climb; steel prop; speed ring; self-starter: $3,000. Wings Corporation of Philadelphia, Wings Field, Blue Bell, Pennsylvania.

AERONCA C-2: Excellent condition, licensed; new cylinders, heads and piston assembly; refinished; new type landing gear; enclosure; $350 cash, or trade larger ship. Photograph. Joe Slager, Transcontinental Airport, Toledo, Ohio.

FOR SALE: Monoprep with enclosure; Velie motor; semi air wheels with brakes; heater. Licesed till September. No trades. Will sell for $450. A. Kuhall, Jr., Dresden, North Dakota.

OXX-6 TRAVEL AIR: Just completely rebuilt and recovered, motor majored. New Scintilla and Berling magneto, Miller overhead, new Fahlin propeller, big wheels. $525. Gustav Imm, Fergus Falls, Minnesota.

MONOCOUPE VELIE: Good shape, $425. Thaden all metal J-6 300 h.p.: Brakes, rate of climb, turn bank. five-place; excellent condition; $1,350. Trade on Waco F. G. H. Dusman, York, Pennsylvania.

STINSON LYCOMING JR.: Late 1930, licensed April 1935. Has had splendid care, never cracked; guarantee 800 actual hours: rare bargain. $1,275. No less. Jones Repossessed Car Sales, 121 Alexander Street, Rochester, N. Y. Phone: Main 8019.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

DRIGGS SKYLARK: Rover. Latest model. Semi-air wheels, brakes. Licensed to February. Less than 50 plane hours. Must sell at once. B. H. Seydel, 342 Paris Ave., Grand Rapids, Mich.

WARNER CESSNA: 4-place, licensed; 500 hours, 15 since major; late heads; covering perfect; shielded for radio; new tail wheel, semi air-wheels, Bendix brakes, bank turn, N A C A cowling, steel propeller; ship and motor completely overhauled 15 hours back. Fast ship, never cracked; best offer over $1,000 takes it. AERO DIGEST, Box 1816.

TANK MOTOR: Model 63; like new. Challenger Robin, Lycoming Stinson, Loening Commuter, Moth, J6-5 Stinson; cheap, will give terms. Pioneer Aviation Company, Airport, Syracuse, New York.

DRIGGS SKYLARK: Powered with Rover 75. Excellent condition and small amount of time. Air-wheels and other extras. Sell or trade. Central Air Service, Grand Rapids, Michigan.

J-5 WACO: Good flying condition. Needs recovering for license. $800. Also 8-place Wasp Stinson: Perfect condition, just relicensed; $2,500. 528 Avon Road, West Palm Beach, Florida.

KINNER BIRD: Three-place; motor major overhauled. New covering last month. Has air wheels, air speed, impulse starter and extra motor parts. Painted ivory, orange and black. Cannot be told from new. Licensed to June '35. $1,100. Kenneth Wright, Marietta, Ohio

FOUR AIRPLANES in excellent condition: Keystone Commuter amphibion; Lycoming Stinson; J-5 Fledgling (for banner work); OX Challenger. For further details or inspection: Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

TRAVEL AIR J-5, starter, air wheels, brakes, perfect. $1,250. OX-5 Travel Air, perfect, $550. Aeronca two place, $850. Eaglerocks, $150 and $350. Want Eaglerock parts, J-5 speed ring. Sell parts Travel Air, Waco F, Eaglerock A-2. Crane Garage, Toledo, Ohio.

WACO MODEL A: Jacobs, 125 hours. Flown only by owner; excellent shape. Beechcraft, Hangar No. 9, Roosevelt Field, Mineola, New York.

FOR QUICK SALE: J-6 Robin, many extras, $1,250. Challenger Robin, $975. Curtiss Junior, $385. Bach trimotor, Kinner Fleet, Challenger Eaglerock; prices on request. All ships excellent condition, licensed. WRITE for bargain sheet of supplies: tubing, spruce, bolts, covering materials and dope. EXPERT repair work, all types of planes. Department of Commerce Approved station. See also advertisement in Planes and Engines section. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

WACO J-5: Straightwing. Engine, ship completely overhauled. Licensed July 1935. Speed ring, steel prop. Challenger Robin, engine majored, ship completely recovered, overhauled. Like new. Air Activities Airport, West Chicago, Illinois.

BARGAIN: Long wing Eaglerock OX-5, in good condition. Easy to fly. Identified; can be licensed. $265, cash. Stephen Petrovic, 150 Brahm St., N. S., Pittsburgh, Pennsylvania.

J-5 PITCAIRN PA-6: Thoroughly equipped for blind and night. Bonded, shielded for radio. Perfect condition. Cash or trade; no reasonable offer refused. A. Deemer, Jr., 327 Western Ave., Brookville, Pennsylvania.

ALEXANDER FLYABOUT: Two-place cabin. Late type Szekely 45 h.p. Motor, 115 hours. Plane damaged. Price $250. Consider trade on car. H. Gordon, 517 Dearborn St., Iowa City, Iowa.

$285 BUYS Command-Aire, NC licensed; OX-5, Miller action motor; D H wheels, wings recovered, new propeller, excellent condition. Call at once. Pioneer Aviation Co., Airport, Syracuse, N. Y.

KITTY HAWK: Kinner 100; licensed to May 1935; 15 hours since major engine overhaul; airwheels, steel propeller, turn and bank; equipped for Heywood starter. $950. Frank Steinman, Hangar F, Roosevelt Field, Mineola, New York.

STINSON J-5: Six-place. Licensed March 1935; never cracked. Excellent condition, ready for unlimited cross-country service. Bargain for $1,350. Spencer Laboratories, Akron, Ohio.

COMPLETELY REBUILT J-5 Eaglerock: Only 10 hours since complete overhaul. Excellent buy. Also Waco F-2, Continental 210, latest model; only 60 hours. Like new. Sacrifice for cash. Foley & Co., Hangar 55, Roosevelt Field, Mineola, N. Y.

CIRRUS ENGINES: (English Mk. III) 97 h.p. at 2,100 r.p.m. Brand new, $250. Suitable Avian or Great Lakes. Licensed. N. W. Perdew, Hasbrouck Heights, New Jersey.

FOR SALE: Warner Stinson; Velie Monocoupe, new covers; will trade. Want two-place Aeronca or other light ship. Ray Vaughan, 77 Morningside Drive, Akron, Ohio.

NB-8, GENET 80: Good condition. 200 hours. $550. Will trade for 20 Caterpillar or light car. Perry Markley, McCune, Kansas.

ROBIN: With new OX-5 motor, Miller overhead, air wheels, duals; just completely refinished and relicensed; excellent condition. Terms to responsible parties. Foster Oil Co., Pierre, S. D.

WARNER CESSNA: Recovered and relicensed till June 1935; extra instruments, steel propeller, tailwheel, 50 hours since motor overhauled; $950 cash. O. E. Dickerhoof, Chanute, Kansas.

SPECIAL DE Luxe 300 h.p. Wasp Jr. four-passenger Stinson. Radio, flares, landing lights, ice warning indicator, turn bank, rate climb, airspeed, compass, clock, complete motor instruments, speed ring. Cruises 125, top 150; gas for 600 miles. Few hours. $3,500 cash. AERO DIGEST, Box 1822.

ARROW SPORT: LeBlond 65. Good condition. 175 hours total time. Dual controls. Licensed. Bargain at $400. Soo Skyways, Inc., Sioux Falls, South Dakota.

AMERICAN EAGLET: Szekely 45, completely overhauled. Ship repainted. Excellent shape. Heavy duty landing gear. Never cracked. Excellent for cheap instruction. $575. John A. Spensley, 944 East 43rd Street, Brooklyn, New York.

FOR SALE: Waco four-place cabin, late 1933 model; flares, landing lights, radio; total flying time, 75 hours. Will sacrifice. AERO DIGEST, Box 1829.

FOR SALE: Licensed OX-5 Robin. Russell Metzger, Canal Winchester, Ohio.

WACO F-2: Continental powered; electric starter, wheel pants, steel propeller, landing lights, flares, cockpit cover, etc. Perfect condition. Paul Peterson, 2503 Union Ave., Altoona, Penna.

BIRD KINNER: Like new. Rubbed finish throughout; yellow wings, black fuselage. Complete instruments, semi-air wheels. Licensed till April 1, 1935. 10 hours since major overhaul. $1,400. Carl Grau, Ottawa, Illinois.

J-5 WACO TAPERWING: Both plane and motor completely rebuilt throughout. Plane completely recovered, finished in high gloss vermilion with black striping and bronze exhaust stacks. We believe this ship is as good in every detail as it was when it left the factory, except that it has a much better finish. Twenty-one coats wet sanded down to give ship beautiful high gloss finish. Cylinders reground and new oversized pistons installed. New valves and guides. New windings in magnetos. For anyone that believes as we do, that some of the older J-5 model planes are more reliable and superior to the later models, this ship will be ideal. It is as good as it can possibly be made, sparing no expense. Price $2,200. Viking Flying Boat Co., (Florida) Inc., P. O. Box No. 3302, Miami, Florida.

BARGAINS: Late front exhaust Kinner Fleet, blue and yellow; Warner Cessna, semi-air and tail wheels, navigation and landing lights, white with Lockheed red panel top, very attractive; Challenger Robin, just recovered, white and black; single-place Aeronca; Kinner and Challenger engines complete; Warner parts. All airplanes just relicensed, engines overhauled, in excellent condition. Will consider trades or time payments to responsible parties. Indiana Air Service, Bendix Municipal Airport, South Bend, Indiana.

FOR SALE: New Curtiss-Wright Jr. 2-place open pusher monoplane; regular price $1,570; special price, $795. American Eagle 3-place OX-5 biplane, only 160 hours total on plane; splendid condition, worth much more; special price, $425. American Eagle 3-place OX-5 unlicensed biplane, only 200 hours total on plane; newly covered excepting fuselage, on which covering is fair; motor excellent, $375. We handle complete line airplane and aviation supplies, including all OX-5 and OXX-6 motor, carburetor and magneto parts, and many Hispano, Liberty, LeRhone parts. Send for Aviation Bulletin; also OX-5 Parts Catalog. Logan Aviation Co., 716 Superior, N.W., Cleveland, Ohio.

OX-5 CHALLENGER: Excellent condition; motor new. Licensed to February. Blue and silver. Spare motor included. Priced reasonably. W. R. McKnight, Hightstown, New Jersey.

WACO NINE: Always hangared. Motor turns 1450 on ground. New Edo "C" pontoons. Waco Glider (new). Best offer takes one or all. Louis Seahurg, Jamestown, New York.

STINSON JUNIOR: Bargain. Privately owned, licensed, never cracked. Wright J6-5. Wonderful condition. For quick sale, $1,000. H. T. Dawkins, 925 Union Avenue, Memphis, Tennessee.

MISCELLANEOUS PRODUCTS AND EQUIPMENT FOR SALE

FOR SALE: Acroplane with Continental 40 h.p. motor, generator set mounted on Ford truck. Cost $3,250. Complete, $1,150. John Hemphill, 255 Victoria Blvd., Kenmore, New York.

HEATH WINGS: New condition, complete with tank, $45 set. Heath factory-built Henderson, used 5 hours, $85. Other parts. James Scimone, 30 No. Portland Ave., Brooklyn, New York.

EDO DE LUXE FLOATS for use on Waco F or similar ship. Used 85 hours, perfect condition. Complete with struts and water rudders. Write Hawthorne Flying Service, Charleston, S. C.

FOR SALE: Hawk-Eye Aerial Camera. F45. 254 mm. 4 x 5. U. S. Army type L. $50. $10 down, balance C. O. D. In good condition. Henry H. Wolfe, Route 8, Box 294, Dayton, Ohio.

PARTS GUARANTEED GOOD CONDITION: Pioneer rate of climb indicators with bottle, $30; Pioneer turn and bank indicators with NEW venturi, $28; Pioneer airspeed indicators, $7; Pioneer cylindrical compass, $13; German altimeters with German precision, $8; Pioneer tachometers, $10; Jones tachometers, $3; NEW Stromberg carburetor, NARSA, $50; 6.50 x 10 semi-air wheels, nearly new, $55; Hamilton steel propellers for Kinner, Warner, OX-5, $45; Eclipse starter for J-5, $30. Aviation Salvage Company, 6205 South Menard Avenue, Chicago, Illinois.

FOUR WINGS: De Havilland wooden fuselage type, two damaged, tail section complete, miscellaneous parts. One English Gipsy engine, 20 hours top overhaul. Make offer for all or any part. Fonda Aviation, Inc., Westfield Airport, Westfield, New Jersey.

PROPELLERS: Lowest prices in the country. Steel props for J-6, J-5, Warner, Kinner and OX. Hamilton wood props, $15. Marshall, Bennett and Flottorp propellers for all motors. Central Air Service, Grand Rapids, Michigan.

TRY OUR WING EXCHANGE: Trade your wrecked wings for rehuilt or new ones. We also have spars, ribs and struts. New London Aircraft Co., New London, Ohio.

WARNER PARTS 90% OFF. AERO DIGEST, Box 1817.

MISCELLANEOUS PRODUCTS AND EQUIPMENT FOR SALE

CARBURETORS: NAR-3, $20; NAR-9, $50. MAGNETOS: J-5, J6-7, Continental, 110 Warner, $20. STARTERS: J6-5 Heywood, $75. Continental direct electric, $100. ENGINES: Kinner 210, $300; J6-5, $250; both need top overhaul—will trade for what have you! New exhaust collector rings, $25. Reconditioned Cirrus heads with valves, $25 and $30. Tail wheels, tires and tubes, navigation lights; bank and turns; rate of climbs. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pa.

J-5, $350. J6-5, $550. J-5 parts, 60% off list. Warner, J-6 and Continental used parts. DH Gipsy heads, $25. Wanted: F-141 starter, five J-6-E cylinders. AERO DIGEST, Box 1821.

J-5 HAMILTON metal prop. OX Command-Aire upper right wing and tail surfaces. LeBlond 65 motor. Waco 10 lower right wing. 20 x 9-4 Goodyear Airwheels, hubs, tires, tubes. Any reasonable offers considered. Airview Flying Service, Red Bank, New Jersey.

FOR SALE: Set of 32 brand new Heath ribs with spars and cross-braces for left half. Originally cost $60. Make offer. S. Bostwick, Woodland, New York.

PONTOONS for 1932 or 1933 cabin Waco, complete with fittings and extra tail surfaces. In excellent condition. Recently overhauled by Edo. AERO DIGEST, Box 1828.

WANTED TO BUY OR TRADE

WANTED TO BUY: Good used licensed four-place cabin plane. Give full description and price in first letter. Address W. S. Rodman, Kimball, Nebraska.

WANTED: Aeromarine 40-powered flying boat, less motor and instruments. Spot cash. What have you? W. S. Elliott, 930 H St., N. W., Washington, D. C.

WANTED: Best float job $400 cash will buy, licensed and delivered Washington, D. C. Either radial or Hisso. 2920 McKinley St., N. W., Washington, D. C.

TRADE: 80 acres South Missouri land, located near Highway 65 and railroad, for two- or three-place ship. What have you? Willis Hammonds, Omaha, Arkansas.

WILL PAY CASH for 27 horsepower Cleone or Cyclomotor engine. Must be in good condition and reasonably priced. C. H. Zimmerman, 1500 Chesapeake Avenue, Hampton, Virginia.

WANTED: Aircraft engines and engine parts. Condition immaterial. Also T A 6000 late type landing gear, and aircraft instruments. Write "Air-Parts," Glendale, California.

WANTED: Fairchild 24 two-place cabin or similar ship, in first-class condition, with or without motor. Must be cheap for cash. Give full history and enclose photo of ship. Will return same. AERO DIGEST, Box 1825.

LET US FIND YOU a buyer for that used plane, crackup, motor or equipment. Send complete description and price wanted. Used Aircraft Directory, Athens, Ohio.

HAVE CASH FOR Curtiss Junior, unlicensed or licensed with Velie or other similar overpowered motor. Absolutely must be in good condition. Foster Oil Co., Pierre, South Dakota.

WANTED: Good cabin ship, Stinson preferred. Will trade in excellent licensed OX-5 Travel Air; many extras, including new Russell chute. Lt. H. B. Poindexter, Sperryville, Virginia.

WANTED: Upper and lower wings for Great Lakes, also fin and rudder. Might consider ribs and spars. H. B. Taylor, Las Vegas, New Mexico.

WANTED: Tank motor No. 63 or 73, new or used. State full particulars in first letter. Louis Carpenter, Jr., 7 East Main St., Mount Kisco, New York.

WANT: J-5 Stearman upper wings, any condition, or fittings to them. Trade small Stutz Blackhawk sedan for ship, giving or taking boot. AERO DIGEST, Box 1823.

WANTED: Parts for 1930 Kinner Lincoln PT; motor mount, prop, landing gear, motor cowling, Stromberg carburetor, oil tank, etc. Itemize prices. Fred Block, Peoria, Illinois.

HAVE 1934 CHRYSLER: Brand new, cost $1,080. Will exchange for plane. What have you? 352 Classon Avenue, Brooklyn, New York. Main 2-2660.

POSITIONS WANTED

TRANSPORT PILOT: Used 5312 hours; never damaged. With good care and regular meals will fly indefinitely. Can handle any flying job anywhere. Age 33, single. AERO DIGEST, Box 1827.

YOUNG MAN: 25; aeronautical manufacturing and transportation, sales and stenographic experience; now employed, desires position as secretary and/or assistant to aviation executive. In or near New York. AERO DIGEST, Box 1814.

TRANSPORT PILOT with OX-5 Waco wants place to operate for the season or permanently in the East. Will consider small investment. AERO DIGEST, Box 1818.

TRANSPORT PILOT: 600 hours, 1A-2A ratings. Radiophone license, instrument flying experience, 26, single, reliable, good references. Graduate Boeing School. Go anywhere. AERO DIGEST, Box 1819.

AIRCRAFT CONSTRUCTION foreman desires connection newly formed organization. Can develop quantity production any type aircraft. Seven years experience. References. AERO DIGEST, Box 1820.

HELP WANTED

WANTED: Aircraft sheet metal foreman, experienced in streamlining, dies and all metal construction. Must know how to handle men and get production. Preference will be given a man who is now in this line of work and has actually done the work himself. Practical experience is of greater importance than theory. Write giving in detail your experience for the past ten years, salary and education. AERO DIGEST, Box 1812.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

PATENTS: Small ideas may have large commercial possibilities. Write immediately for information on how to proceed and "Record of Invention" form. Delays are dangerous in patent matters. Clarence A. O'Brien, 3142 Adams Building, Washington, D. C.

SACRIFICE: Complete Transport Pilot's course. Large School. Best Equipment. Cost $2,250. No reasonable cash offer refused. Inquire immediately. Leroy Levis, Rockfall R. F. D., Conn.

COMPLETE PARACHUTE COURSE: $110. Includes 20 airplane drop tests. Meets Department of Commerce chute rigger's license requirements. Chicago Suburban Aviation Corp., Stinson Airport, La Grange, Illinois.

WANTED: Connection for 8-place Wasp Stinson and three-place J-6 Laird biplane, perfect condition. Transport Pilot owner, over 4,000 hours night and day and blind flying experience. Or will sell. 528 Avon Road, West Palm Beach, Fla.

PARACHUTES FOR SALE

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

INDEX TO ADVERTISERS IN THIS ISSUE

BECOME AN EXPERT PILOT MANY HOURS SOONER AND CUT THE COST OF YOUR FLIGHT TRAINING

Practical Flying

A Training Guide for Pilots

by Major B. Q. Jones

Air Corps, U. S. Army; formerly Chief of Aviation, A.E.F.

Reading this book is like having at your elbow the famous flyer who wrote it, ready to clear up quickly all the scores of questions that puzzle you as you progress to the skill of an expert pilot. It is the first book that the beginner ought to read before he even gets into an airplane. The most experienced pilot will find it filled with practical suggestions and explanations of vital value.

First, Major Jones outlines the physical and mental characteristics that you should possess if you wish to become a pilot. Then he describes all the parts of a plane, instruments, etc.; discusses maneuvers in the air; and explains technical expressions and slang terms.

From this he proceeds to clear and concise answers to the hundreds of questions that student pilots have asked for years—information that is essential for a proper understanding of piloting. For much of the detailed information, the explanations are provided in question and answer form. A wide range of practical subjects is covered, such as the most useful instruments for each class of flying, why a magnetic compass spins during fog-flying, "dead-stick" landings, taxying, straight-away flight, glides, turns, figures-of-eight, methods of plane inspection, testing controls and motor. Particularly important are his detailed explanations of the causes of crashes during take-off and turns for landing; how to recognize stalls in time and correct for them; how stalls progress into spins and how to get out of them easily.

Major Jones is a famous Army pilot and has himself trained hundreds of successful flyers. He has been flying since 1914 and was the first man to take up a plane and purposely put it into a stall to find out what happened and what to do. During the World War he was the Chief of Aviation Training and achieved the magnificent record of the lowest training casualty rate of any of the armies. Thousands of copies of his book have been bought by student and licensed pilots because it gives them exactly the kind of practical help that they want.

Price $3.00

EVERY AIRMAN NEEDS THIS BOOK

Aircraft Radio

***by Lieut. Myron F. Eddy,** U. S. Navy, Retired. 68 illustrations.* **$4.50.**

The only complete guide to the principles, equipment, installation, operation, and maintenance, of aircraft radio. Tells how it is used in aerial navigation, with complete details about apparatus, radio beacons, instrument-board visual indicators, etc.; how weather data and flight orders and reports are exchanged between airplanes and ground stations; how radio sets are installed in planes, and how the plane is electricallly bonded and shielded to eliminate interference; how to service radio sets; full details of specific circuits; the Federal regulations, etc.

USED BY FAMOUS DESIGNERS

Engineering Aerodynamics

***by Lieut. Cmdr. Walter S. Diehl,** (C. C.) U. S. Navy, Scientific Section, Bureau of Aeronautics. 150 illustrations.* **$7.00.**

In this book America's outstanding authority covers modern hydrodynamic theory and its practical applications, including stream function, velocity potential, circulation vortex theory, induction theory, etc. Test data on standard wing sections, ailerons, streamlining, etc., are included with working diagrams and equations, and detailed instructions for their use. Shows how to interpret model test data, gives methods for designing control surfaces, and for rapid performance estimation.

PREPARES FOR ANY LICENSE TEST

Aeronautics

***by Hilton F. Lusk,** Transport Pilot; formerly Dean, Boeing School of Aeronautics. 175 illustrations.* **$3.25.**

This is a complete ground school course in handy book form. It clearly and thoroughly explains all the subjects you need to understand to pass the written part of the government examinations for a license as an airplane pilot in any of the grades—including transport pilot—or as an airplane or engine mechanic. No one who masters this book will have any difficulty in answering any question that may be asked in the license examination. 224 test questions help you test your grasp of each subject. It is so clearly and simply written that you will have no trouble in grasping its explanations even if you must study at home without the aid of an instructor. One entire chapter is devoted to a description of 125 occupations in the aeronautic industry, with educational preparation recommended for each, rates of pay, etc. The 15 chapters explain just what you need to know about Flight Principles; Airplane Construction; Operation; Engine Principles, Construction, Operation; Propellers; Blind Flying and Engine Instruments; Maps; Piloting; Dead Reckoning; Avigation Instruments, Equipment; Meteorology.

A COMPLETE ENGINE COURSE

Aircraft Engine Mechanics Manual

***by C. J. Moors,** Chief Instructor, Dept. of Mechanics, Air Corps Technical School, U. S. Army. 189 illustrations.* **$4.50.**

This new book deals with all types of aircraft engines and their accessory equipment. For each it explains fundamental principles; gives full data on construction and operation; supplies detailed instructions for proper maintenance; and shows you exactly how to go about making any necessary repairs or adjustments. Trouble shooting is thoroughly covered—you are given full instructions on how to locate the cause of any trouble. The book's thirty-eight chapters include: Elements of Mechanics; Engine Construction and Repair Principles; Operation, Maintenance and Repair of Specific Engines; Carhureters, Superchargers, Luhricants; Ignition and Electrical Equipment.

ESSENTIAL FOR SAFE FLIGHT

Airplane Mechanics Rigging Handbook

***by R. S. Hartz,** formerly Lieut. Colonel, Air Corps, U. S. Army; and **Lieut. E. E. Hall,** formerly Editor, "Aircroft Servicing." 104 illustrations.* **$3.50.**

This hook covers in detail the care and handling of airplanes on the ground and in the shop; sequence of rigging steps; how to true up the assemhled ship; how to adjust the wings and control surfaces for "hands off" flying; spars and struts; inspection; installing and checking compasses; fahrics; wood and glue; metal parts; wire; dopes and doping; folding and packing parachutes. It shows you how to get a plane into proper flying condition and how to keep it that way.

(Fill in, tear out, and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,
Dept. M796, 15 East 26th Street, New York

Send me the books checked below. Within five days after their receipt I will either return them or send payment in full at the prices shown plus a few cents for delivery charges. (We pay delivery charges when cash accompanies order—same return privilege.)

- ☐ Jones, *Practicol Flying*..... $3.00
- ☐ Eddy, *Aircroft Radio*..... 4.50
- ☐ Diehl, *Engineering Aerodynomics*..... 7.00
- ☐ Lusk, *Aeronoutics*..... $3.25
- ☐ Moors, *Engine Monuol*..... 4.50
- ☐ Hartz-Hall, *Rigging Hondbook*..... 3.50

Name .....

Home Address .....

City..... State*.....

☐ Employed by,
☐ or Reference .....

(Above line must he filled in unless you send cash.)

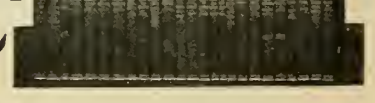
*If outside continental U. S. and Canada, send cash plus 25c per hook for shipping.

"The World's Best Books on Aeronautics"

28 VOLUMES dealing with every phase of aeronautics are published hy The Ronald Press Company. Thousands of students, pilots, mechanics, executives, and engineers use and endorse these practical manuals.

Sent on 5 Days' Approval—Your Satisfaction Guaranteed

You can order any of the books described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.



WITH BYRD to the POLE

As in every great American flight of this decade, Thompson Valves are with Admiral Byrd on his second antarctic expedition. His Curtiss-Wright Condor is powered by two 700 H.P. Wright "Cyclone" engines to which Thompson Valves are contributing their important share of reliability in the extreme polar temperatures.

Thompson Valves

THOMPSON PRODUCTS, Inc.
General Offices: Cleveland, Ohio, U.S.A.
Factories: Cleveland and Detroit

Eclipse equipment serves the whole great American Airlines fleet

STRAIGHT through the great American Airlines fleet, including the luxurious new convertible sleeper planes, Eclipse equipment is standard. Starters, generators, landing gear motors, etc.—all are of Eclipse manufacture. Virtually the entire aviation industry expresses a similar preference for these time-proved units. This universal high repute is one of the most valued assets Eclipse possesses.

ECLIPSE AVIATION CORPORATION

EAST ORANGE, N. J.

(Subsidiary of Bendix Aviation Corporation)

AERO DIGEST

INCLUDING

AVIATION ENGINEERING

AUGUST 1934

35 CENTS

CURTISS-WRIGHT CONDOR

fly these routes DAY & NIGHT

ON AMERICAN AIRLINES AND EASTERN AIR LINES

Curtiss-Wright Condor Day Planes

Curtiss-Wright Condor Sleeper Planes

Curtiss-Wright Condors are now in operation on all of the main divisions of the Coast-to-Coast network of American Airlines—Chicago to New York, New York to Boston, Cleveland-Dallas-Fort Worth and Dallas-Fort Worth-Los Angeles. Eastern Air Lines has a fleet of Condors in operation between New York, Washington, Richmond, Atlanta, Jacksonville and Miami. In the foreign field, Swissair operates a Curtiss-Wright Condor on its high speed service between Zurich, Munich and Vienna. Additional planes have been built for the U. S. Army, the U. S. Navy and for Admiral Byrd's Second Antarctic Expedition.

The new Curtiss-Wright Condor has a cruising speed of 165 miles per hour and a top speed of 190 miles per hour at 8,000 feet altitude. The payload of the standard day-plane arrangement normally consists of 15 passengers, 450 pounds of baggage and 200 pounds of air mail, totaling 3,200 pounds. The payload of the sleeper-plane arrangement consists of 12 passengers, 360 pounds of baggage and 200 pounds of air mail, totaling 2,600 pounds. The Condor has a normal fuel capacity of 350 gallons, with an additional 25 gallons available if desirable, which provides for a cruising range of nearly 700 miles.

CURTISS-WRIGHT AIRPLANE COMPANY

AERO DIGEST, *August*, 1934 *Volume* 25. *Number* 2.

Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

Army and Navy Primary Training Plane . . . Models PT-1-3-3A and NY-1-2-3

The Fleet Military and Commercial Training Plane . . . Models 5, 10 and 11

Military Reconnaissance Airplane . . . Model 0-19

Commodore Twin-Engine Commercial Transport Flying Boat . . . Model 22

Fleetster High-Speed Commercial Transport . . . Models 17 and 20

Long-Range Naval Patrol Flying Boat . . . Model P2Y

Naval Bombing Airplane . . . Model B2Y

Two-Seat Military Pursuit Airplane . . . Model P-30

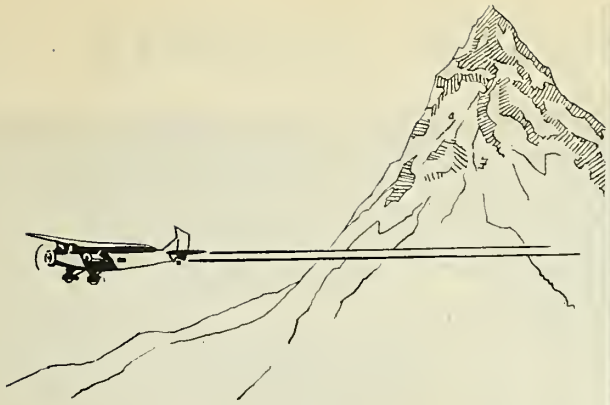
Convertible Primary-or-Advanced Military Trainer . . . Models PT-11 and BT-7

Military Attack Airplane . . . Model A-11

CONSOLIDATED AIRCRAFT

• • • means aircraft certified by *11 years experience* in the design and production of more than *1600 airplanes* with records which total well over *135,000,000 flight-miles* in serving the Governments of the United States, Argentina, Brazil, Canada, China, Colombia, Cuba, Mexico, Peru, Portugal, Roumania, Siam and Spain. Among the *10,000 and more, military, commercial and private pilots* throughout the world who have been trained in Consolidated planes . . . "Consolidated Aircraft" has become the standard expression in all languages, for dependable equipment.

CONSOLIDATED AIRCRAFT CORPORATION
BUFFALO · · NEW YORK



John H. Littley, now flying in the land of the Midnight Sun, one of 40 Parks graduates placed during the past 45 days.

From ALASKA To PERU PARKS GRADUATES ARE MAKING GOOD!

"Flying is certainly different up here," writes Parks graduate John H. Littley from Anchorage, Alaska. "I am writing this at eleven o'clock and the sun is just setting. The colors are beautiful, blues, yellows, reds and purples and every combination of these, with the mountains silhouetted against the sky. I have flown over some areas that are not even on the maps; just blank spaces. Since I have been up here I have averaged at least one charter trip a day, with either freight or passengers to such points as McGrath, Fairbanks, Ophir, Flat, etc." Littley left Parks on June 19 for Alaska, where he is making good in a big way.

A letter just received from Ernest W. Grey, who received his special training and his transport license in May, states, "Here I am away down in Lima, Peru, as co-pilot and radio operator for Pan American-Grace Airways. My application seems to have hit the company just right, for here I am."

Littley and Grey are only two of more than 40 *Parks men who have accepted good jobs within the past* 45 *days.*

Parks Air College has never guaranteed or promised a job to any student, but it is an inspiring thing to have aircraft executives call on us with increasing frequency for well trained men. Parks graduates are working for every leading airline and airplane manufacturer, and on the finest airports in America. If you are ambitious and will work hard, aviation is calling you. But remember your entire future depends upon *where* and *how* you are trained. Aviation has no room for the untrained or poorly trained man. So choose Parks Air College —largest in the world—the School of Champions.

Send the coupon below for a free copy of our profusely illustrated catalog. It will give you complete information without obligating you in any way!

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Approved by U. S. Dept. of Commerce

SECTION 8-AD PARKS AIRPORT, EAST ST. LOUIS, ILL.

MAIL THIS COUPON for Full Information About Courses.

PARKS AIR COLLEGE, SECTION 8-AD
PARKS AIRPORT, EAST ST. LOUIS, ILL.

Send me your illustrated catalogue, "Skyward Ho," and full information about the course checked.

☐ Executive Transport Pilot
☐ Aeronautical Engineering
☐ A. & E. Mechanics
☐ A. & E. Master Mechanics
☐ Limited Commercial Pilot

Name ..... Age .....

Address .....

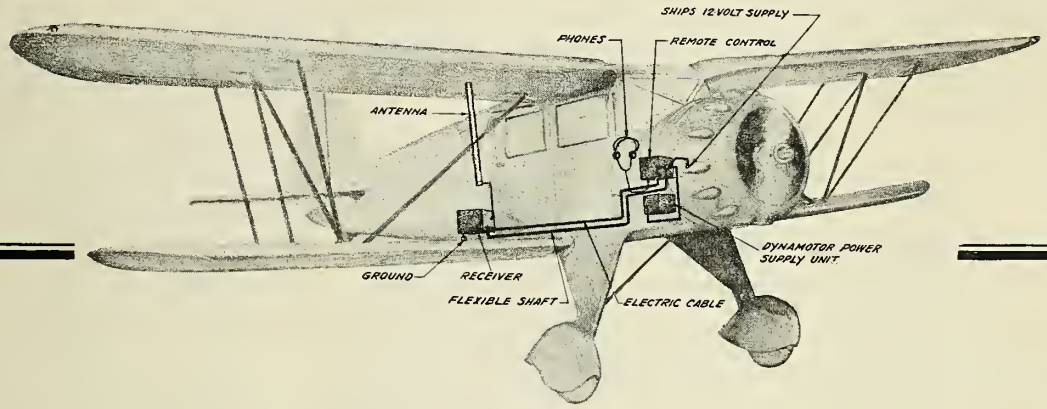
City ..... State .....

THIS *Everyday* SCHEDULE

200 m.p.h. cruising speed +
5900 lbs. useful load +
1200 miles range =

DOUGLAS
Transport

RCA VICTOR
AIRCRAFT RADIOBEACON
RECEIVER AVR-2



THE newest — highly sensitive — highly selective — Radiobeacon Receiver. A SUPERHETERODYNE designed and manufactured at "Radio Headquarters" — by RCA Victor. Small and light, applicable to any aircraft, large or small — for remote or local control installation.

Dynamotor power supply unit supplies all required voltages direct from aircraft 12- or 6-volt storage battery, assuring carefree operation. Uses no dry batteries.

The RCA Victor Radiobeacon Receiver comes COMPLETE — ready for installation — all cables cut and fitted, with all mounts provided — with tubes and headphones. The installation is very simple and inexpensive.

This receiver will insure complete coverage of all airways radio stations providing constant weather information and radiobeacon guidance. It also provides reception of the many airport radio traffic control stations so necessary to safe landings during poor visibility. Invaluable to instrument flight — and most desirable on all cross country flying.

For any *aviation radio requirements, consult* RCA VICTOR — *or for information or demonstration, communicate with* AIR ASSOCIATES, INC.

Post Office Box 333
Garden City, L. I., N. Y.
(Located on Roosevelt Field)

5300 West 63rd Street
Chicago, Ill.
(Located on Chicago Municipal Airport)

1200 Airway
Glendale, Calif.
(Located on Grand Central Airport)

RCA VICTOR

RCA VICTOR COMPANY, INC.
Camden, N.J. *"Radio Headquarters"*

DALLAS AVIATION SCHOOL AND AIR COLLEGE • DALLAS, TEXAS

YOU WILL SAVE MONEY AND GET **MORE** AND **BETTER** FLYING TRAINING

IF YOU COME TO DALLAS

NOT just because our prices are lower—but because these low prices actually give you EVERYTHING—that's why we know you can't beat Dallas. We keep expenses down, but we give our students the best of everything that really counts. WE KNOW HOW to develop high-class pilots without a lot of useless costs—and we DO IT! Boy—you'll have the time of your life down here in Texas, where it's good flying weather all year!

THIS IS HEADQUARTERS FOR

LONG & HARMAN

AIR MAIL SYSTEM

• A Company headed by officials of Dallas Aviation School holds U. S. Government contracts for flying 2,200 miles of air mail in Texas daily. Our students really LEARN what it's all about.

YOU GET PLENTY ACTION **HERE** — BUT YOU MUST FLY SAFELY

• Veteran pilot instructors—safe and sane rules and methods—ships and motors that never leave the ground unless they are in perfect condition—that's D. A. S. We protect our students!

Yet there is no other school in America where students get more action—every day—than here.

Love Field is a million dollar airport—one of the Nation's best.

Texas is a land of sunshine and good flying weather.

This is a U. S. Government approved flying and ground school.

Our school line-up of ships and motors is one of the best in America.

Everything is in the student's favor here.

We have over $200,000 invested in equipment.

We have two full-size hangars—20 modern aircraft—30 air-cooled motors.

Our students work in large, fully equipped machine, motor and aircraft shops.

We own our own dormitories and cafe. Living costs are low.

Quick bus lines from field to city—all hours—10c fare.

Dallas has over 300,000 population.

DALLAS

AVIATION SCHOOL AND AIR COLLEGE

Major W. F. (Bill) LONG, Pres. C. E. HARMAN, Gen. Mgr.

LOVE FIELD DALLAS, TEXAS

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$ 595
Private Pilots' Course	$ 545
Amateur Pilots' Course	$ 350
Master Mechanics Course	$ 300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five per cent from the above prices for payment in full at time of enrollment.

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

These special inducements are for you — Now! Write or wire for Catalog and full information.

USE THIS COUPON:

DALLAS AVIATION SCHOOL AND AIR COLLEGE
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

Transport Pilot ☐
Limited Commercial ☐
Private Pilot ☐
Master Pilot ☐
Master Mechanic ☐
Aviation Radio ☐
Complete Radio ☐

Name .....
Address .....
City .....
State .....

THE BLUE PENNANT SHIP OF THE AIR

The "Brazilian Clipper"—Sikorsky built S-42—powered by four Pratt & Whitney "Hornet" Motors, has carried the heaviest load to the highest altitude with the greatest speed of any air transport in the world.

PAN AMERICAN AIRWAYS, INC.
GENERAL OFFICES - CHRYSLER BUILDING NEW YORK CITY

The B. G. Corporation,
136 West 52nd Street,
New York, N. Y.

July 19, 1934

Gentlemen:

You will be interested to know that for the seventh consecutive year B-G Spark Plugs have been used as standard equipment by the Pan American Airways System. They have merited the confidence of our engineers by their dependability in the extremes of conditions under which we operate.

They were originally installed on the "Brazilian Clipper" and have contributed their full share to the successful operation of this newest of Pan American Clipper Ships.

Very truly yours,
PAN AMERICAN AIRWAYS, INCORPORATED,
Karl F. Lueder,
Ass't to Purchasing Agent.

Patented in the United States and other countries

THE B. G. CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 WEST 52nd STREET, NEW YORK — Cable Address: Golsteco, New York

KENDALL MEANS VICTORY!

In AIR RACES ★ PRIVATE FLYING ★ TRANSPORT SERVICE

1930 . . . Natianal Air Races, 84.2% af all winners used Kendall

★

1930 . . . Jacksan and O'Brine established refueling endurance recard using Kendall

★

1931 . . . Natianal Air Races, 86.02% of all winners used Kendall

1932 . . . Natianal Air Races, 86.82% af all winners used Kendall

★

1932 . . . warld's speed recard far land planes braken using Kendall

★

1933 . . . Natianal Air Races, at Los Angeles 97.2% af all winners used Kendall

1933 . . . Chicaga Air Races, 95.9% af all winners used Kendall

★

1933 . . . Majar Seversky established warld's speed recard far amphibians using Kendall

★

1934 . . . Pan American Air Races, 79.25% of all winners used Kendall

★ Kendall's quality superiority is an accepted fact among thousands of aviators. That's why the engines of so many winning planes are lubricated with Kendall, The 30 Hour Oil.

KENDALL REFINING COMPANY · BRADFORD, PA.

KENDALL
THE 30 HOUR OIL

Where training and facilities EXCEL

.....in the air and on the ground!

ABOVE: *Actual photograph of Ryan students in five ship formation flight practice near San Diego.* TO THE LEFT: *Students enjoying a noonday "siesta" in the Spanish loggia on the field side of the Ryan Administration Building.*

Beautiful modern buildings erected by RYAN specifically for student needs; courses which greatly exceed Department of Commerce requirements; Government Approved repair shops for mechanics courses and ground school; perfectly maintained flying equipment of the latest type including a wide variety of modern planes and motors; commercial operations augmented by frequent daily schedules of major airlines; North Island—the government's largest military aeronautical operating base—with huge shops and over 300 military planes; and San Diego's famous semi-tropical year 'round weather. . . . All these combine to make the RYAN SCHOOL OF AERONAUTICS the objective of those who demand the best.

Fall and Winter classes are now forming. Take advantage of the lowest rates in Ryan history which will soon, of necessity, be advanced. Plan now to spend your winter months with us in Southern California. Mail the coupon below—and ask about our FREE TRANSPORTATION offer to San Diego.

I am interested in the courses checked; please send additional information.

☐	Transport Pilot $1795	☐	Mechanic's Course $175
☐	Limited Commercial 585		WEEMS' NAVIGATION*
☐	Private 585	☐	Residence Course 150
☐	Amateur 295	☐	Home Study Course..... 100
☐	Ryan deluxe Combination Course of Transport training plus new 1934 Great Lakes Airplane, was $3985..... NOW $3555		

**Lt. Comdr. P. V. H. Weems, international authority on Marine and Aerial Navigation, is in personal charge of this specialized training. This is an exclusive feature offered only at the Ryan School.*

NAME ..... AGE .....

ADDRESS .....

CITY ..... STATE .....

U.S. DEPT. OF COMMERCE — HIGHEST TRANSPORT RATING — Approved

RYAN SCHOOL OF AERONAUTICS

Lindbergh Field

In Sunny SAN DIEGO, CALIFORNIA

"The world's finest grease lubricant"

A *tested* and *proved* economy for

Rocker-Arms

Rocker-Arms are subject to heat and pressure that quickly destroy ordinary grease. MARFAK has demonstrated its ability to lubricate perfectly under all operating conditions. MARFAK will not throw out. It minimizes wear and the number of engine overhauls. Important leaders of commercial aviation such as "TWA," "PAN-AMERICAN," "EASTERN" have proved that MARFAK is safe and economical.

TEXACO offers *you* MARFAK—a grease lubricant that has *proved itself able to do three times the work of ordinary greases.*

A Texaco Engineer will gladly give you ample proof—based upon performance in service similar to yours—that MARFAK is "The World's finest grease Lubricant." Write to The Texas Company.

THE TEXAS COMPANY · 135 E. 42nd St., N. Y.

NOTE TO DEALERS You will find it very profitable to sell Texaco Aviation Products. They are increasingly popular at aviation fields everywhere. Write to The Texas Company for details on an interesting proposition.

MARFAK

TEXACO REG. T. M.

NRA

THERE IS A TEXACO *tested* LUBRICANT FOR EVERY PURPOSE

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER TWO

CONTENTS FOR AUGUST

COVER DESIGN

The Lambert DeLuxe Model 90-A Monocoupe powered with the 90 horsepower R-266 Lambert engine

Published monthly by the Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy, 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5.

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

Equally at home above land or water, the unusual Curtiss-Wright amphibion is test flown over Long Island by its designer, Captain Frank Courtney

AIR
Hot and Otherwise

●

FRANK A. TICHENOR

● The set-up of the new Federal Aviation Commission is a paradox. The factor calculated to make it possible for the Commission to render a constructive, unbiased report is the very one which also lays it wide open to the feints and blows of selfish interests. Three of the five members of the Commission know little or nothing about aviation. The remaining two have been active in aeronautics long enough to have acquired prejudices.

Apparently, the President made his appointments deliberately to get just such a "balance of power." That fact is revealed by the story that is told of how Clark Howell was called to the phone at his home in Atlanta a little over a month ago. He heard the President's voice on the other end of the wire.

"I am leaving tonight; I've called to tell you good-bye and ask you to do something for me," said the President.

"I'll do anything I can," Howell replied.

"I want you to act as chairman of this aviation commission I am appointing today."

"What I don't know about aviation would fill a book," said Howell.

"I know that. That's why I want you to act. I want this problem solved from a business as well as from an expert standpoint."

A Well Balanced Board

Although there's no record of what the President said to Albert J. Berres and Franklin K. Lane, Jr., their appointment would indicate that he also wanted the problem considered from labor and legal standpoints. Thus, on the face of the thing, he has a well balanced board to study aviation's woes, wherefores and whithers. In the endoderm of the thing, however, there are the germs which breed and nourish parasites. Because these men come to their job with little knowledge of aviation, they necessarily also come to it with little understanding of the possible ulterior motives behind the suggestions they will likely receive from some quarters.

There's no use beating around the bush—men are men, in aviation as in any other field—hence some men in aviation are selfish. Those men, and the interests they represent, must not be allowed to sway the recommendations of the Commission at the sacrifice of the development of the air industry as a whole.

Since the War, there have been eleven previous Federal investigations of aviation of one sort or another, and not one of them has entirely escaped the influence of prejudiced and/or predatory interests. In a few cases that influence was of minor importance. In the others, it was definitely detrimental to the industry. Despite such set-backs, however, aviation has marched steadily ahead. And it will continue to do so, no matter how this present Commission does its work.

Just the same, this board has it in its power to quicken the pace or to retard it, depending upon the wisdom of its judgments. The wisdom of those judgments in turn depends upon their freedom from animus and prejudice, and to a great degree, that becomes the responsibility of the so-called experts on the Commission. The non-experts have been placed in a spot where they must rely greatly on the counsel and advice of Hunsaker, Warner and Colonel Cone, who is serving as executive secretary. It is to them that the layman members must look for help in identifying and appraising the sincerity of the various groups, factions and interests in aviation. If, through preconceived notions or previous conditions of servitude, these three men give the other three a miscue, then the blame for any resulting flaws in the Commission's recommendations will be theirs.

Therefore, these experts must, right in the beginning, perform one of the most difficult feats of self-discipline that man is ever called upon to perform. They must free themselves of any and all lurking personal ambitions. They must plumb to the depths of their subconscious minds and ask themselves, "What is it that I, as a man active in aviation, really have been expecting to get out of aviation? What positions, political or private, do I aspire to hold in aviation? What returns have I been expecting for the investment of my years of activity in aviation? These are the things which it is my patriotic duty to prevent at all costs from swaying me as long as I am one of the members of the Federal Aviation Commission."

If the experts will honestly analyze themselves in this way—and actually do it, not merely make the gesture of doing it—then this Commission has a chance to make brilliant aviation history, yes even brilliant American history. If they fail, it will be because they were not big enough men to rise to the occasion, and those ambitions which they could not quiet will return to haunt them. For the aviation industry realizes they occupy key positions, and the aviation industry will know with whom the failure lies.

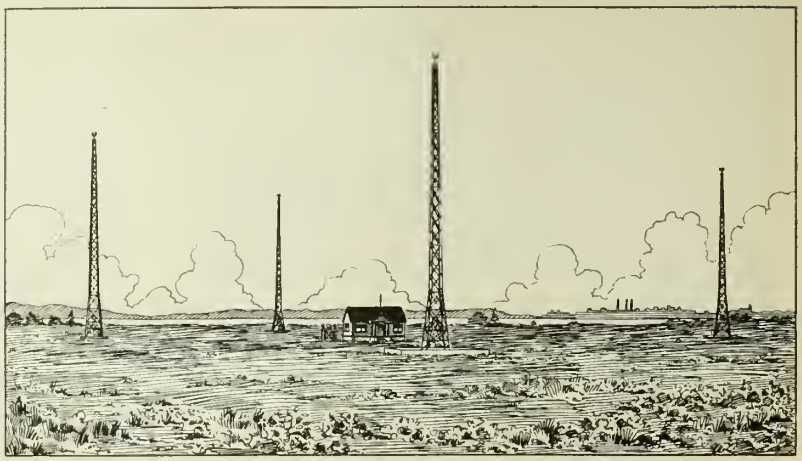
Dealing From a New Deck

Here at the outset, AERO DIGEST—and we feel confident this goes also for almost the entire industry—is willing to give them every benefit of the doubt. We are willing to assume that this deal is from a new deck, that there are no marked cards, and that there will be no dealing from under the deck. If we expect these men to free their minds of prejudices, we must do the same. The task before the Commission is a tremendous one—and an important one. It cannot be taken lightly, either by the Commission or by the industry. It behooves everyone who has the interest of aviation at heart to cooperate in this work with the same disinterested and objective spirit that he expects of the Commission itself. And let those who seek selfish ends take heed—to the degree that they attain their selfish ends, to just that same degree will they jeopardize the growth of aviation. If they damage aviation, they damage themselves in the long run, irrespective of what temporary gains they may make. For no one in aviation can prosper for long unless the whole of aviation prospers.

And so we say to the Federal Aviation Commission—"Happy landings and good luck. All of aviation is watching to see what kind of pilots you prove to be. All aviation is keeping a critical eye on your navigation. For, in the final analysis, all aviation is a passenger aboard your ship, depending on you to stick to the course, find the way through the soup and land safely at our common destination—a greater aeronautic industry!"

Improvements on the Federal Airways

REX MARTIN
Assistant Director of Air Commerce
in Charge of Air Navigation



Federal airways system radio station with four steel tower antennas connected with the transmitter by underground cables

● By means of radio and teletypewriter, the pilot flying a radio-equipped airplane along one of the Federal airways is in closer contact with people on the ground than is the driver of an automobile speeding along a highway.

On nearly 20,000 miles of air routes the beacon lights, intermediate landing fields, radio communication stations, radio range beacons, radio marker beacons and teletypewriter circuits maintained by the Department of Commerce enable flying to go on at night and under conditions of poor visibility during the day. There still are weather conditions which make flying impractical, but with the assistance of aids to air navigation, the scheduled operators now are able to complete 95 per cent of the trips started.

Accomplishments on the Federal Airways System during the past year consisted chiefly of continuous improvement in the various services with which airmen already were familiar, but at a cost $2,117,710 less than Congress appropriated to do the job.

The year's work included some outstanding projects: About 2,700 miles of new airways are under survey, several existing routes are being relocated to give better service, and important studies and experiments have been undertaken in aeronautic radio. But the Air Navigation Division takes more pride in the results it has achieved in improving efficiency in day-in and day-out operations, yet reducing the cost to the taxpayer of the Federal Airways System.

When the Bureau of Air Commerce began the present fiscal year on July 1, 1933, newly appointed officials occupied the posts responsible for determination of general policies. The immediate problem was the budget for maintenance and operation of the Federal Airways System which had been reduced more than 30 per cent from the total which had been appropriated by Congress, and which had been regarded as essential to the efficient operation of air navigation aids. For the fiscal year 1933 there was appropriated $7,553,500; although the appropriation for 1934 was $6,590,210, the actual amount available under executive order was only $4,472,500. In order to assure safety on the established air routes of the country, it was necessary to maintain substantially the mileage of lighted and radio-equipped airways that was in existence at the close of the preceding fiscal year. Each proposal of the program for the year had to be weighed as an opportunity to save money, and also with respect to its probable effect upon efficiency and safety, the latter factor being the controlling one.

The necessary savings were brought about without any serious curtailment of the service as shown in the following table:

	July 1, 1933	June 1, 1934
Airway mileage:		
Miles lighted	18,100	17,315
Miles day (unlighted)	256	256
Miles lighted routes on day airway status (lights not operating)	644	1,499
Miles new routes under survey	0	2,747
Intermediate landing fields	269	257
Beacon lights	1,831	1,630
Radio communication stations	68	70
Radio range beacons	99	97
Radio marker beacons	70	78
Miles teletypewriter circuits	13,000	11,814
Personnel:		
Washington	50	45
Field	1,715	1,541
Total	1,765	1,586
Special employees for PWA projects	0	155

The present lighted airway mileage is only slightly less than last July, and in a few months, after completion of new routes authorized, it will exceed the total for July 1, 1933.

The table shows fewer miles of lighted airways in operation and more routes available only for day flying. Some airways upon which beacon lights and lighted intermediate landing fields are in place are not urgently needed for night flying, and the lighting facilities therefore are temporarily inoperative in the interest of economy. The intermediate fields are available for landings during daylight hours and the standard directional arrows on the ground at the beacon light sites are as useful as ever, so that these are in effect day airways during the temporary period of inoperation. Later, if night schedules are to be undertaken on the routes, the airway aids will be returned to service, or if it appears they will not be needed where they are now, the equipment will be dismantled and used elsewhere.

The total number of intermediate landing fields has decreased; also there are more day fields at which there is no expenditure for maintenance of lights. The number of beacons is smaller. Radio facilities are about the same. It was possible to effect a considerable reduction in mileage of teletypewriter service (with an appreciable saving in expenditures) by rearranging the circuits.

Personnel figures show a reduction. A circumstance favorable to the retrenchment program was that air navigation aids have tended to become more and more automatic in character, requiring less attention from mechanics and operating personnel. The force of workers has been reduced by leaving vacancies unfilled and by rearranging assignments of the remaining employees where necessary. Some employees engaged on projects which came to an end were placed on indefinite furlough status. There are now approximately 2,000 employees in the whole Bureau of Air Commerce.

The comparative figures, as a whole, show an airway system substantially the same as that in operation a year ago, but maintained with about 30 per cent less money, and a comparatively small reduction in personnel. Reductions which appear in the tabulation represent the pruning out of facilities which were no longer vital to safety of aircraft operation. This accounted for a part of the necessary economy, but was not sufficient, by itself, to account for a saving of more than $2,000,000.

A study of the airways system revealed opportunities for rearranging facilities so as to effect economies and at the same

time to improve the service. Airway facilities become obsolete, just as do the aircraft using them, and some of the older airways no longer met the needs of air transportation as they did when first established. The changes usually consist of relocating sections of airways along more direct routes, with a reduction of the number of lights and fields provided. The saving to the Bureau is brought about by reduced maintenance; the advantage to airmen by the shortening of the route and the modernization of facilities.

Construction work incident to these changes was made possible by Public Works Administration allotments. Many of the projects are still in process, and the resultant economies will not make themselves felt until the next year. Public Works has authorized more than 60 projects for the Bureau of Air Commerce among which are many involving small sums of money, while others are of considerable magnitude, making substantial contributions to relief of unemployment.

Six new airways, totaling 2,856 miles, all extensions of or connecting links for existing routes, are included in the program. They are the Northern transcontinental (Seattle-Twin Cities), 1,521 miles; Fargo-Pembina, 144 miles; New Orleans-St. Louis, 519 miles; Tulsa-St. Louis, 352 miles; Galveston-Waco, 211 miles; and Louisville-Indianapolis, 109 miles. Further requests have been made for funds to install lighted and radio equipped airways to cover additional routes now being flown with the mail.

The Louisville-Indianapolis airway is now in use; the other five airways (totaling 2,747 miles) are under survey, and soon will be ready for actual construction work.

A new type of airway installation designed to increase the efficiency of the intermediate landing fields and radio aids to air navigation, will be provided on the New Orleans-St. Louis, Seattle-Twin Cities and Tulsa-St. Louis airways.

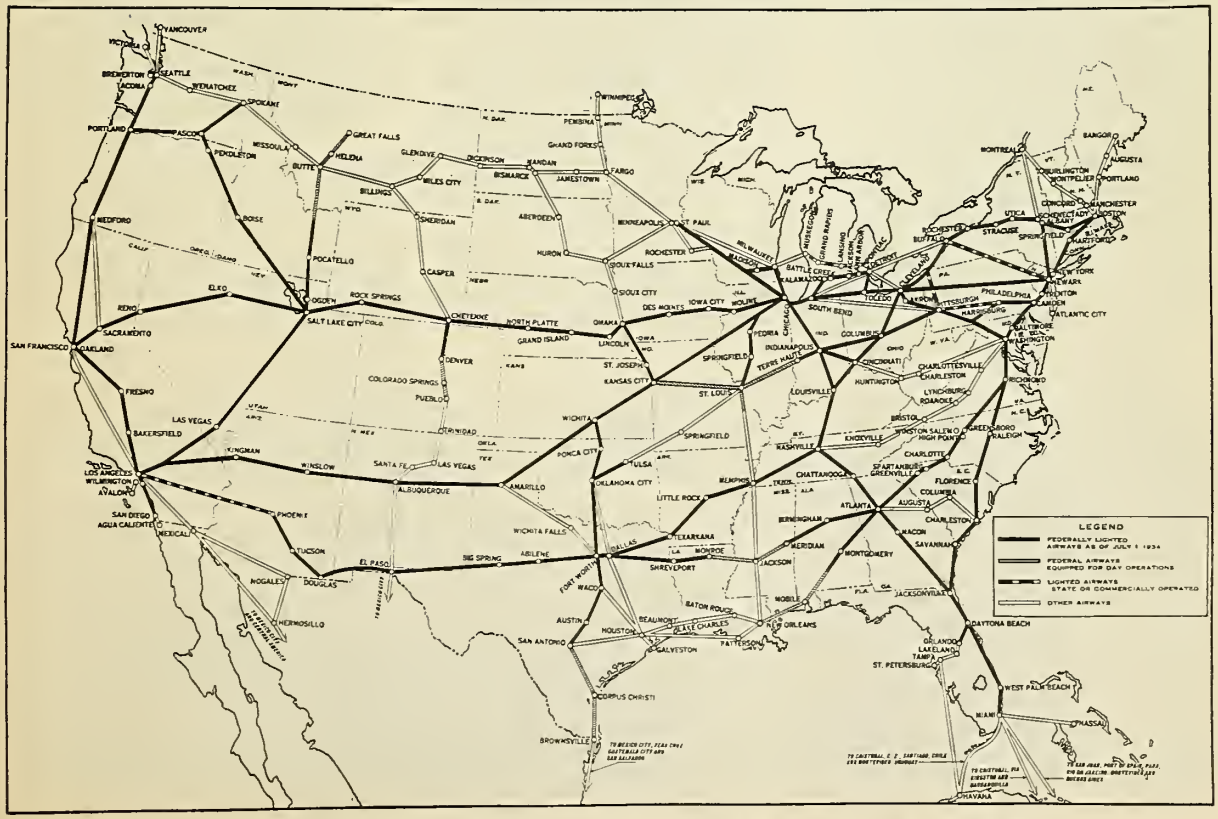
This system calls for establishment of adequate and completely equipped intermediate landing fields at 50-mile intervals, connected by beacon lights in a direct line. Each field will have runways and lights, weather reporting service, two-way radio station and a miniature radio range beacon effective up to 25 miles from the station. While nearly all present intermediate fields are lighted at night, many are inadequate in size, others are located off the base lines of the airways and none has, as standard equipment, the radio contemplated for the new-type installation.

The radio range beacon generally used for directional guidance (effective for 100 miles) transmits courses which have a tendency to split up and confuse airmen in mountainous country. The small beacons will reduce this difficulty. With miniature beacons, radio-marked airways can be laid out through passes and valleys, whereas, with the big radio beacons the routes have to be on a straight line, regardless of the character of the terrain.

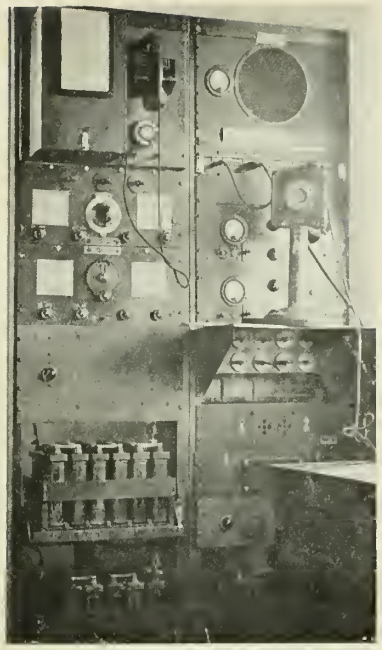
As the Louisville-Indianapolis airway provides a direct route from Chicago to the southeast, the lights on the present airway between Lafayette and Evansville, Indiana will be removed. Thus, this section, although it is a new route, also contributes to the realignment process which is being carried out by airway relocations along the following routes: Omaha-Chicago; New York-Boston; Pittsburgh-Harrisburg; Amarillo-Waynoka; Daggett-Kingman; Brownsville-San Antonio; Phoenix-El Paso.

Obstructions to air navigation in the vicinity of intermediate fields have either been removed or lighted. Old types of equipment were replaced by modern and more efficient apparatus. Many blinker lights were removed and replaced by revolving beacons. Field boundaries were changed to permit slight enlargements, or otherwise to adapt the fields to new aircraft operating at higher speeds.

Another change in the installation of



Latest airways map of the United States showing routes equipped with Federal aids to navigation



Distant control system for operating radio beacons and broadcasting. This apparatus is located several miles from the transmitter

beacon lights which reduces cost of operation without impairing service is the elimination of course lights, with another arrangement for conveying a part of the information formerly given by the course lights. These lights are not essential to show the direction of the route, since in weather clear enough for navigation by lights it is always possible to see at least two along the desired route. Therefore, many of the beacons which have 36-inch double ended lights have been equipped to show a red or green flash, according to location, and course lights have been removed.

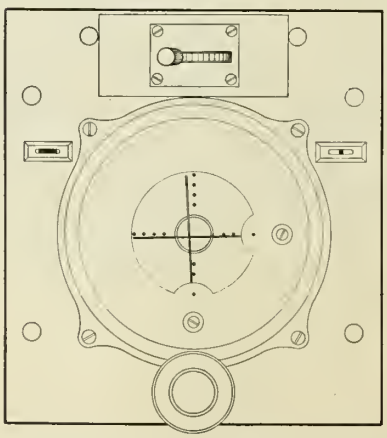
In putting into effect this change in beacon lights, and all other readjustments of air navigation facilities, the Bureau has closely preserved distinctive features of the airways system with which pilots are familiar, and upon which they depend for guidance. Where necessary to introduce a new idea affecting the technique of using air navigation aids, it is carefully worked out as a logical development of what is already in existence, so as not to confuse the pilots.

The policy of improving and enhancing efficiency with minimum change in the service is even better evidenced in the development of radio facilities. Radio improvements are introduced as promptly as possible, almost invariably without requiring pilots to learn a new technique. This cannot always be avoided, and when it is necessary for pilots to change their habits, the adjustment is made so that the new procedure grows out of the old.

Introduction of distant control of airways radio communication and radio beacon transmitters has enhanced efficiency of these aids, and improved weather service at airports, without changing the broadcasts that airmen receive while in flight. On June 1, there were 42 stations operating under the procedure, 40 of which went into service during the present fiscal year.

With distant control, the personnel and controlling equipment are concentrated in one office at the airport. Transmitters for the radio communication station and the radio beacon are at a distance, where their antennas will not be obstructions to air navigation, and are connected with the control station by telephone circuits. Teletypewriter weather reports come to the airport station, broadcasts are transmitted over the telephone from the central station to go onto the air at the distant transmitter, and the radio beacon is operated by a dial switch in the airport office. Fewer employees are required, their work is better coordinated, and contacts with pilots at the airport before and after flights are made more readily. At some points, radio communication stations and radio beacons now operate as combined units, the two transmitters sharing a building, antenna and other equipment, saving not only space and equipment, but also the time of operators and mechanics who maintain and service the station. There are 14 combined stations now in operation.

The Bureau of Air Commerce has continued installing miniature range type marker beacons, 16 being in operation on June 1. At the beginning of the fiscal year there were only 4 such markers. These markers send directional courses which can be followed just as the beams of the regular radio range beacons, but being less powerful, cannot be received as far away as the signals from the larger stations. They are used as homing devices for intermediate landing fields to fill out an airway course over a stretch which is not long enough to warrant installation of a large station or in any other situation where short range directional service is needed. Located ordinarily at intermediate landing fields, they are situated so that one of the courses passes directly over the landing area.



Instrument showing aural signals visually

Standard 36" beacon with course lights mounted on top. Wind sock indicates beacon is adjacent to intermediate field

Vertical radiator type antennas (T-L antennas) have been installed at 26 stations since July 1, 1933, bringing the total of stations so equipped to 37. This antenna, designed for use with radio range beacons, consists of four steel towers, connected with the transmitter by underground cables. They are not subject to the "night variations," a swinging of courses which sometimes takes place after sundown with loop antennas. The vertical radiators also are efficient for voice transmissions, and can be used for both radio beacon and voice broadcasts at combined stations.

Another problem in connection with radio beacon transmission for which the Bureau still is seeking a solution is that of multiple courses in mountainous country. In some localities pilots receive what appear to be "on course" signals. In level country the phenomenon does not exist, so that it appears to be the effect of mountains on the transmissions. Two Department of Commerce experts, a pilot thoroughly conversant with the theory and practical application of the radio range, and an electrical engineer detailed for this work, are making ex-

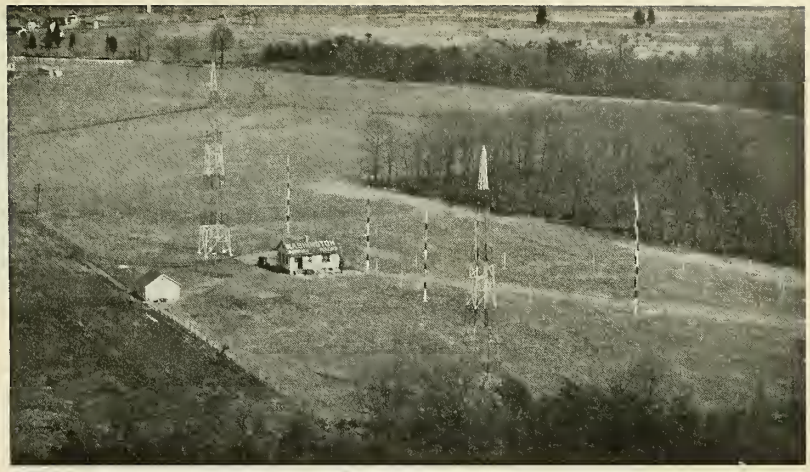
tensive studies of the multiple courses. Engineering colleges and universities have been invited to cooperate by assigning to graduate students research problems, the results of which would have a bearing upon this problem.

The beacons involved are known, and the pilots can use them without hesitation after familiarizing themselves with the individual peculiarities. In an emergency, the pilot can fly toward the station, even on a false course, and thus find his way to the airport near which the radio beacon transmitter is located. Nevertheless efforts are being made to eliminate the difficulty as already has been done with night variations.

Visual indication of radio beacon signals is another objective. Signals registered on a dial on the instrument panel would free the pilot from the strain of constant listening to dots and dashes when flying blind and it would clear the way for other use of the earphones, as will be seen later.

In past years, the Bureau of Air Commerce has sponsored experiments with a visual radio range beacon, the signals of which are registered by a pair of vibrating reeds. The reeds may be observed directly (equal vibrations indicating "on course" and unequal vibrations representing "off course" to the side of the longest vibrations) or the set may be equipped with a needle pointer giving indications on an instrument dial. Many of the radio range beacons now operating could be used for visual type transmissions, but there has been little or no call for them as the necessary receiving equipment is not in general use.

Within the past year radio engineers of the Bureau have developed a method of visually interpreting the aural radio beacon signals now relied upon for directional guidance along the airways. If generally adopted, pilots could receive directional signals in the headphones or on the instrument panel, at their choice.



Typical airways radio range station operated by remote control from the airport. The two principal antenna towers are 125 feet in height, topped by obstruction lights

Planes equipped with ordinary radio but not the special equipment for visual reception could get the signals aurally. A description of this system was published in the May issue of AERO DIGEST.

A logical extension of the visually-interpreted aural system would be simultaneous transmission of radio beacon signals and voice on the same frequency. The Air Navigation Division already has made studies of the proposal, and is preparing for tests under service conditions.

The experimental station at Pittsburgh, Pa., is equipped with a radio beacon transmitter, a transmitter for voice communication, and two antennas. The antenna for the radio beacon is a set of four vertical radiator towers. A fifth tower, located in the middle of the block of radio beacon antenna towers, serves for voice communication.

Although both transmissions are on the same carrier frequency, those of the radio beacon are modulated to 400 cycles higher than the carrier, while the voice signals are the carrier frequency plus or minus 500 to 4,000 cycles. The aircraft receiver filters the signals, directing those of the radio beacon into a converter for visual interpretation, and those representing voice to the headphones.

At present radio beacon signals are broadcast continuously until time for a weather broadcast. The directional signals then stop, and the weather broadcast goes on the air for a period not exceeding three minutes, after which the radio beacon signals are resumed. With simultaneous transmission, the directional signals need not stop, and voice could be broadcast at any time without interfering with radio directional guidance.

Experiments with the radio for blind landing are continuing. The system developed by the Army Air Corps has been investigated, tested by the Bureau of Air Commerce and found suitable. During this work, the Bureau's test pilots under a hood employed a tri-motored transport

(*Continued on page 72*)

Airways keeper's quarters, teletype station, radio marker beacon and fuel storage tanks at an intermediate field

Fifth Annual Soaring Contest At Elmira

●

R. E. DOWD

Lew Barringer in the Bowlus-duPont Albatross II taking off from the airport

● "Walk! Run! Let Go!," shouted pilot Jack O'Meara to a hastily assembled ground crew of farm hands on South Mountain. With a swish, his Baker McMillan glider catapaulted out over the tree tops. Onlookers gasped with the tenseness of the spectacle for here, for the first time, was a man-carrying glider poised in air over Elmira's mountainous terrain. Could he possibly make the airport two miles away? That question flashed through the minds of everyone present—all except Jack, for he had already felt a reassuring lift under his wings and was nosing his ship crabwise along the ridge. The minutes slipped by, but still he flew back and forth not in a long winged sailplane heretofore thought necessary for soaring, but in a heavy secondary, or utility training glider. One hour and thirty-eight minutes later when he did land for an unofficial duration record, the crew went wild with excitement. At last America had a Wasserkuppe. This all happened on July 3rd, 1929.

Little did that astonished group of spectators realize that in the span of a few short years, Elmira would become world famous and firmly established as America's Glider Capital, and moreover, that a motorless flight would be made from her grassy slopes to within thirty miles of Times Square, New York City—one hundred and fifty-five miles without power! Such, however, has been the phenomenal progress of soaring flight in America.

The Fifth Annual National Soaring Contest was conducted this year from June 23rd to July 8th by The Soaring Society of America under the rules of The Federation Aeronautique Internationale, and sanctioned by The National Aeronautic Association. So much for the official sanction and affiliations which are necessary for the proper drawing of rules and regulations and recording of performances. Major J. C. Cone, of the Bureau of Air Commerce, Department of Commerce, delivered the official opening address of the occasion.

From an administration standpoint, the outstanding feature of the 1934 contests was the efficient organization of various groups, each charged with separate and distinct responsibilities. To Warren E. Eaton, of Norwich, N. Y., President of the Society; Earl Southee, its tireless Manager, and Charles H. Gale, timer, goes the credit for this fine piece of execution. From an achievement standpoint, the 1934 contests were the greatest ever. There were more licensed gliders entered—thirty to be exact—exceeding by eight the 1933 figure. Also more launchings (128), more time in the air (117 hrs. 31 min.), greater altitude (6,224 ft.) and finally a new world's distance record (155 miles). In every branch, records toppled and the art of cloud soaring was practiced with a facility far exceeding previous efforts.

If we search for a one word answer or explanation of all this progress, it can be found in "science." Applied "science" in designing, building and flying the various gliders. "Science" in recording, tabulating and forecasting the weather. In connection with the latter, let's follow a typical days routine at the Soaring Society's headquarters on Henry Harris Ridge.

Promptly at five a.m., the Curtiss Robin M.I.T. weather ship takes off with pilot Joe Barber at the controls. The occasion is the daily flight to 12,000 ft. altitude. The ship is laden with delicate recording instruments, carefully installed and calibrated by the meteorological group, headed by Dr. Karl O. Lange. After a check-up of the findings of this flight, a second check is made with regular Department of Commerce radio reports. Now the weather group is ready to talk to the glider pilots at the seven o'clock morning meeting. At this point there is either a general relaxation due to an unfavorable forecast, or a scurrying to the various take-off points which have been recommended. As in the past, the weather man still reigns supreme at glider contests, but how different from the old days when pilots lounged around the airport with eyes glued on the drooping wind sock, only to scatter in seventeen different directions when it displayed some animation. The Soaring Society owes much to the aid of the M.I.T. meteorological group which continues to check reports and make recommendations throughout the day.

Reference has been made to the Henry Harris Ridge which now constitutes the main point of activity. This very satisfactory take-off point has been developed at a cost of some ten thousand dollars under one of our New Deal alphabetical projects. It is about three hundred feet higher than old location Number Six, and overlooks that spot which served so well in past years. The clearing is large enough to permit the operation of planes and auto towing is extremely simple, thereby permitting airport experience to be used to the fullest extent. It is claimed that no other soaring spot in the world possesses these advantages.

Lines of tents, refreshment stands, radio stations and meteorological buildings border the field. Loud speaker units,

Col. Cone being greeted by Warren Eaton.

Southee gives Miss Kimball clearance papers

Jack O'Meara takes off from Harris Ridge in his Chanute Sailplane

located at strategic points on the ridge, give the setting the appearance of a carnival or air race. The camps string along the sides and indicate, through the medium of savory cooking and flapping laundry, that domestic "science" too is practiced, although perhaps on a basis less precise than some of the other sciences.

A survey of this most interesting picture leaves one contemplating our national glider resources for such they are when considered as a training medium for pilots. With Germany boasting some 10,000 glider pilots and Russia thrice that number, it does seem that something is wrong when we claim less than five hundred. But we do claim quality, if not quantity, both in our ships and our men. Let anybody deny that! In the meantime, our air services, both army and navy, are making a belated study of the possibilities of the glider in primary training.

It was inspirational to witness the arrival of some of the various Club delegations. With their gliders in tow on trailers, they treked in from points hundreds of miles distant. Red eyed and weary from strain and fatigue, they rolled in with their precious cargoes. To those who had practiced over flat airports of midwestern cities, the mountains seemed most formidable. However, a few reassuring hops from the lower points soon restored failing courage and they would next be seen sporting over the ridges. The Akron, Ohio Club with its model T Ford and Baker McMillan Cadet II, was an interesting combination of uncertain transportation—gypsy cargo and good American determination. The same can be said of the South Bend, Indiana Club, headed by Clyde Brower, vice-president, although their facilities seemed somewhat more adequate. Then there were the two juvenile globe-trotters, Bob Carey, seventeen, and his buddy and rear guard, Harold Harrington. From Rhode Island State Airport at Hillsgrove they hailed; Bob astride his two-seater Aeronca and Harold, his Bull Pup. "Up there in the Pennsylvania mountains," says Bob, "my map showed a nice single railroad track which I was following, but it divided. I says, 'Eenee, Meene, Minee, Mo,' and decided to take the right hand trail. Later it proved to be a spur track to a coal mine. All the time my buddy was on my tail like the Red Knight of Germany and when I turned back, he just followed. Don't know how we made it but we're here." This coming generation will show us something about this aviation business, I thought, such daring and self-reliance!

This year the women pilots were not content to make short hops. Mrs. Russell Holderman, of Le Roy, New York; Mrs. Richard duPont, of Wilmington, Del.; Miss Margaret Kimball, of Lexington, Mass., and Gretchen Reighard, of Mansfield, Ohio, seized every opportunity to be in the air. In a duration tussle, Mrs. duPont exceeded Mrs. Holderman's time of 4 hours 31 minutes by a few minutes, but did not gain official recognition because a baragraph was not carried. Mrs. Holderman officially holds the woman's American duration record.

The center of attraction during the contest was the Bowlus-duPont group, flying gliders of that name. The Albatross II is a perfectly marvelous piece of design and workmanship. With its arched wings spreading some sixty feet and tips tapered to almost a point, she resembles the great wandering albatross, dean of wind soarers. The plywood fuselage is rather typical in form and construction, except there is evidence of the utmost care in reducing cross sectional area and in streamlining. To further these ends, the pilot sits in a slightly reclined position with thighs supported by extensions of the plywood seat. The feet operate pedals for rudder control by an ankle motion. These are located close together in the very nose back of the aluminum cowl. A small wheel control made in segment form, is provided instead of a conventional stick, and a hand crank on the pilot's right operates the landing flaps which slow the speed and kill the glide. The lift struts running from fuselage to wings are built with ribs and fabric covered to an airfoil section. The fin and rudder remain intact with the fuselage in transporting, but the elevators are removed. A central landing wheel is provided similar to utility practice. In the air the Albatross seems to glide on and on without any perceptible loss of altitude, even when operating over a flat airport. Its gliding angle must be better than one in twenty. It was in this great ship that Richard duPont set out on a distance jaunt. Gaining altitude over the ridge take-off point, the twenty-four year old pilot maneuvered his glider under the large fleecy, cumulus clouds, seeking out thermal currents. From cloud to cloud he hopped in majestic silence. The Alleghanies slowly moved under him as he followed a southeast course. Without map the landscape was puzzling but in due time as he worked down the Susquehanna River Valley, the great Delaware Water Gap appeared and then he managed to get his bearings. With the skyscrapers of Manhattan only thirty miles away, he dropped down over Basking Ridge, clearing at about 200 ft. and finally landed on the airport at Somerset Hills, New Jersey. The duration of the flight was five hours fifty minutes. It seemed that the thermal currents were determined that he should ride no farther, or was it, after all, a magnificent sporting gesture to come in for an airport landing rather than to squeeze the last few ounces of energy from those thermal currents? At any rate, by so doing he left unwon the $3,000 prize offered by his father for an Elmira flight terminating within twenty-five miles from Times Square.

Steve Lichtblau and Chris Harmantas rig up a wind indicator

Pilots of the glider train: Bowen, Eaton, O'Meara, duPont and Holderman

This flight proved to be a world's record, eclipsing the German distance of 136.8 miles. The American altitude record was also shattered by this unbeatable team of pilot and mount. The new figure is 6,224 ft. as compared with O'Meara's 1932 record of 4,780 ft.

Among the new stunts tried out during the contest period was the two-way radio communication between Warren Eaton's glider in flight and the ground radio station. It became possible to obtain meteorological advice from the ridge station, which proved interesting and entertaining to the spectators.

There was also the four unit glider train towed by a Waco plane, piloted by Harold Bowen. One by one the gliders cut loose and stunted as they sought out a previously designated landing spot.

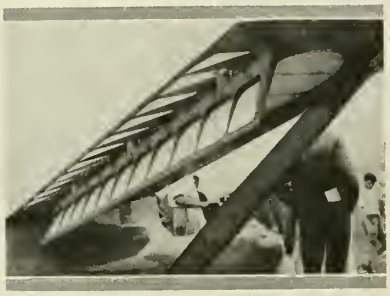
Only one accident marred the perfect record of the Meet and that was caused by a heavy wind storm which struck the ridge with such force that the Stevens Club glider was torn from its moorings. Arthur Braendel, sixteen, of Palisades Park, New Jersey, and his brother Felix, both of the Stevens Institute group, endeavored to hold the craft from lifting. The wind was too strong and both were lifted into the air, Felix dropping off at a safe height. His brother rode upward until his hold was broken by the violence of the wind and he fell some fifty feet. Latest reports state that he is recovering. The weather group had warned the contestants of the oncoming storm but it broke so suddenly that more adequate precautions to safeguard the gliders were not possible.

The Stevens group deserves the highest praise for their determination in the face of difficulties. Their 1934 entry was a beautiful, home-built, tapered wing job using a Franklin fuselage and tail group.

At the close of the contest, the usual testimonial banquets and gatherings were held. Elmira's Mayor Honan and State Senator Feld, assured contestants of the utmost cooperation in arranging for the 1935 Contests. It is understood that with further road and take-off improvements, Elmira will again have the glider boys as their guests.

Glider train of four units towed from American Airways airport

Richard C. duPont was named 1934 American Soaring Champion at the close of the contest. In winning the title, duPont was credited with 16 points, the largest number ever acquired by a pilot in any of the five soaring meets. His points were won as follows: international record (distance), 5; national record (altitude), 3; first place in distance for meet, 3; first place in altitude for meet, 3; second place in duration for meet, 2. The honor carries with it possession for one year of the Evans trophy, emblematic of the soaring championship of the United States.



Lowered landing flap of Albatross II

The list of awards follows:

Distance, sailplanes: First, Richard C. duPont, 155 miles; second, Lewin Barringer, Philadelphia, 77.5 miles; third, J. K. (Jack) O'Meara, New York City, 50.9 miles.

Distance, utility gliders: First, Floyd Sweet, Elmira, 24.25 miles; second, Stanley W. Smith, Lyndonville; third, Joseph W. Conn, Akron, Ohio.

Altitude, sailplanes: First, Richard C. duPont, 6,224 feet; second, Lewin Barringer; third, Martin Schempp, Syracuse.

Altitude, utility gliders: First, Floyd Sweet, Elmira, 3,517 feet; second, Stanley W. Smith; third, Dana L. Darling, Greenfield, Mass.

Duration, sailplanes: First, Martin Schempp, 6 hours 8 minutes; second, Richard C. duPont, 5 hours 53 minutes; third, Emerson Mehlhose, Wyandotte, Mich., 5 hours 42 minutes.

Duration, utility gliders: First, Mrs. Dorothy Holderman, LeRoy, 4 hours 31 minutes (women's record); second, Dana L. Darling; third, Mrs. Richard C. duPont.

Award to group making most trips of 15 miles or over: First, Richard duPont group; second, M.I.T. group.

Awards to group compiling greatest aggregate time in air: First, M.I.T. group, basic time of 28 hours 56 minutes (awarded Sherman Fairchild trophy, to be kept one year); second, duPont group; third, University of Michigan group.

Best all-around junior "C" pilots: First, Nelson N. Shapter, Bayside, L. I., with University of Michigan group; second, Henry Wightman, Montclair, N. J., with same group; third, Gretchen Reighard, Mansfield, Ohio. These awards were given pilots who obtained their "C" licenses this year.

New "D" certificates earned at 1934 contests (highest licenses in gliding) Richard C. duPont.

Most cross-country flights of 15 miles or over: First, duPont group, awarded the "Hank Harris" altimeter; second, M.I.T. group.

Best all-around woman pilot: First, Mrs. Dorothy Holderman, awarded Franklin Corporation, Ypsilanti, Mich., trophy; second, Miss Margaret Kimball, Lexington, Mass.; third, Mrs. Richard duPont.

Lt. Henry Harris memorial for highest altitude regardless of class of glider: First, Richard C. duPont; second, Lewin Barringer; third, Martin Schempp.

Mrs. Richard duPont, Mrs. Russell Holderman, Dr. and Mrs. Klemperer and Floyd Sweet

EDITORIALS

"For many years the National Air Races have convincingly demonstrated their value as factors of enlightenment and inspiration to the American public. Dedicated to the advancement of Aviation, they have served the Aircraft industry as basic laboratories for aeronautical development, from which manifold advantages have accrued."—CLIFF HENDERSON, Manager, National Air Races.

Flight in the Stratosphere

● Ascensions into the upper reaches of the sky where the air is rarified and parasitic drag is decreased are not mere stunts undertaken to stir the imagination of the public. A very definite aid to mankind in general and to science in particular results from these flights.

Aeronautical science will owe a debt of gratitude to the Piccards and others for delving into the mysteries of the stratosphere. It is in this region that the aerial transports of the not-too-distant future undoubtedly will pick their way at the tremendous speeds possible only where the drag set up by the forces of nature is minimized.

Much must still be done before flying at 30,000 feet or more is safe for the every-day air passenger. It is from such attempts as those made by Capt. Albert Stevens, Major William Kepner and Wiley Post that the problems of oxygen supply and air pressure will be solved. When they are, flying at 300 or 400 miles an hour will become as safe and perhaps more comfortable than flying at 160 miles an hour at 5,000 feet or less.

Air Express to Latin America

● For years there has been intense rivalry among nations for the major share of the business emanating from Central and South American countries. Through the intervention of Pan American Airways a forward step in fostering good-will and opening up these rich markets to American products has been made.

In conjunction with the Railway Express Agency, Pan American Airways now provides a fast international shipping service between this country and 30 others in South and Central America. Through long and tedius work it has not only eliminated boundless red-tape by the promulgation of a new waybill, but also has made it possible for the American manufacturer to give his Latin American customers a speedy and expedited service that cannot be matched by any manufacturer in any country. This simplified waybill is expected to make a great deal of difference in the amount of trade which will flow between the various countries and it will eliminate the discouraging documentation formerly necessary to ship goods to those countries. Express formerly held up for weeks and months will now pass through the customs of these countries as fast as the baggage of the air passenger, and whereas at one time days and weeks were required, the new international air express service will deliver merchandise to any commercial center in the Caribbean within two and a half days and to the most distant capital of South America within seven days from the United States.

In the race for these export markets (which normally contribute $2,000,000,000 to the world's trade) we should far outstrip French and German efforts aimed at these trade centers.

The Baker Report

● The widely-publicized report of the Baker Committee has little in it that we did not recommend and campaign for in the past few years.

Now that the government has gone to the expense and time on the subject let us hope it will abide by the committee's recommendations. Should it do so, our industry will be bolstered by the business it will get and by the encouragement provided by the government's solid backing.

The specific recommendations for the encouragement of the industry were for purchase of planes from private manufacturers instead of constructing them in government shops, the fostering of aircraft exporting by the Department of Commerce, and the purchase of aircraft by the War Department by negotiated contract, by competitive bids or by purchase after design competition.

The suggestion that our Army Air Corps (whose morale, incidentally was found unimpaired notwithstanding recent reports to the contrary) be equipped with 2320 planes and manned by a correspondingly larger personnel, would, if carried out, give us an Air Force second to none, and provide an adequate aircraft industry so essential to national defense.

It now rests upon the government to act on these recommendations which are the results of a serious and intensive study by a group to which political affiliations were of no consequence. Immediate action will go far in restoring the Air Corps to its former standing in the eyes of the people of the United States, will help and bring to its feet an industry sorely beset by financial conditions and political investigations and will foster the development of aviation in the country where it was born.

Air Marking Small Towns

● In most regions in good weather navigation in the air requires virtually no effort. When the ceiling is low, and visibility none too good, it requires pretty strict attention to business over almost any territory. Over such rough terrain as Pennsylvania and West Virginia a pilot can rarely afford to lose his way, even for a short time, for the abundance of towns, streams, railroads and ridges make relocation difficult. Under these conditions air travel becomes a chore for the pilot, rather than a pleasure.

This situation could be easily changed simply by having the name of every town easily visible to a pilot passing over it. Typical air markers include the name of the city and town, a meridian marker and an airport pointer.

Further aid to the pilot can be provided by marking Federal and State highways, a program already adapted by several States and now being planned by many others.

The Department of Commerce, Bureau of Air Commerce, has available a General Airway Information Bulletin giving complete information concerning the marking of buildings and highways. This bulletin is recommended to those municipalities who are contemplating a program aimed not only to aid and direct fliers, but also to advertise their town to the ever-growing users of the skyways.

Not only will such markings aid the pilot but are of interest to the passengers of airliners, many of whom try to follow the course of the flight throughout the journey. Airmarking should be made a matter of civic pride. The Chamber of Commerce of every town could accomplish a great deal in this direction. Towns could be air-marked by men and materials supplied by CWA and PWA funds. Here is a ready-made opportunity for putting men to work immediately on projects of permanent value.

We've Captured a Democrat -- Meet Elliott Roosevelt:

CY CALDWELL

● Aviation has encountered and surmounted so many handicaps that when 23-year-old Elliott Roosevelt was announced as Vice-President of the Aeronautical Chamber of Commerce I merely shrugged my shoulders and accepted him as yet another slight impediment to progress. One Roosevelt has allowed his henchmen to walk all over us, and now here was another one moving in as a permanent boarder.

Of course, looking at it another way, appointing Elliott might be a good move for Thomas Morgan, President of the Chamber, to make. After all, aviation was short of Democrats in good standing, for all these past years we had been jogging along under the mistaken assumption that the Republicans would stay in forever. We never took a Democrat seriously until the Head Democrat took us all like Grant took Richmond. Then we checked up on available influential Democrats in aviation and found that the only specimen we had was a night watchman at Roosevelt Field, and he wasn't even in with his District Leader, let alone with Washington and the various alphabet soup agencies that have recently been established.

So perhaps having Elliott with us wasn't a bad idea; if the Democrats weren't good to us we could stop feeding him, or hold him him as a hostage, or demand a ransom for him, like the Chinese do with missionaries in China. Besides, I thought, young Roosevelt could gain admittance to the White House at any time of the day or night without danger of being hurled into jail for collusion, which was more than any one else in aviation could do. Just suppose, for example, that Executioner Black's Ogpu suddenly seized all of the country's airline executives and hurled them into the hoosegow. Who could reach the President and plead for their release on the grounds that they were only poor simple Republicans who didn't know any better? Nobody but another Roosevelt. Whenever a Republican aviation executive was discovered prowling around the White House grounds it has been the custom first to lock up the silver and then telephone General MacArthur, Bonus Army Evictor, and beg him to come at once with a tear gas squad and a couple of tanks to oust the intruder.

So the more I thought about it the more

Vice-president Elliott Roosevelt

I was inclined to believe that having a young Roosevelt on an aviation pay-roll might have advantages. At first, I understand, Mr. Morgan had considered offering positions to Sistie and Buzzie, until some one remembered that their last name was Dall, not Roosevelt. Naturally this spoiled their chances of becoming high-powered aviation executives. Then it was suggested that it might be a placating move to hire Scamper, the White House Bunny; but more cautious counsel prevailed. Leighton Rogers pointed out that rabbits were blessed with such a hearty biological urge that in no time at all the Chamber might be cluttered up with dozens of young Scampers.

While this weighty discussion was going on, Tom Morgan was pacing back and forth wrapped in an air of gloom and a new summer suit. Like King Richard, who, unhorsed on the field of battle, cried, "A horse, a horse! My kingdom for a horse!"—Tom Morgan cried, "A Roosevelt, a Roosevelt! My kingdom for a Roosevelt." Then he added as an afterthought, "Or even an ordinary Democrat." Hearing these frantic cries, young Elliott Roosevelt, who happened to be passing at the moment, entered and said simply, "Here's your Roosevelt—where's the job?"

Perhaps it wasn't exactly like that, but I believe that gives you the gist of it. But when you recall that Elliott is a member of the Reigning Dynasty with the privilege not only of eating breakfast at the White House but even of going to the White House refrigerator late at night for a cold snack, it makes the appointment seem reasonable. After all, if we have to go out and hire a Democrat at this late date we might as well hire one whose name is known.

Now, I study wild life in the Aeronautical Chamber of Commerce and the Bronx Zoo. If they get a new bird at the Zoo, I go up and look it over; and if they get a new bird in the Chamber, I go in and look him over, too. They never charge me for looking at them, because I'm as much of a curiosity to the boys in the Chamber as the boys in the Chamber are to me. The same system is in force at the Zoo; the monkeys get as much fun out of watching the visitors as the visitors get out of watching the monkeys. Anyhow, I dropped in at the Chamber, which is on the 26th floor of a building so the boys can sit and doze and look at the East River when they aren't doing anything. They know the East River by heart and can name all the boats.

I apologized for waking the boys and said I'd just dropped in to look at Mr. Roosevelt, and which cage was he in? Well, they said he wasn't in right then because he'd just moved his wife and two-months-old daughter to New York, and was getting them settled; but he'd be in at eleven because he'd mentioned that he had an appointment to see me at that time. It was then five minutes to eleven, but I didn't expect to see him until around noon, because any Vice-Presidents I'd ever met during boom times were always an hour or two late for appointments, on account of conferences in speakeasies and so forth. But perhaps things were different now, as Mr. Hoover had declared that if we didn't re-elect him there'd be Vice-Presidents growing in the streets. We didn't re-elect him, and I know one former V. P. who is growing on the corner of Broadway and 42nd St. Anyhow, that's where I always see him, leaning against a lamp post, and I presume that he has taken root there, just as Mr. Hoover prophesied.

Sharp at eleven in walked a big stalwart fellow, six feet three in height and weighing around 200 pounds; he had on a suit that needed pressing, and he wore a pleasant smile that reminded me of his father's. We hadn't chatted more than a couple of minutes before I saw that he was as friendly and cheerful and natural an egg as you'd meet in a day's travel, in no way exalted or set apart from us ordinary mortals who weren't Vice-Presidents or related to the potent Potentate of the Potomac.

The office we were in was a bit of a cubby-hole with a desk and a couple of chairs in it, and it was pretty stuffy. Ellictt went over and tugged at the window

(Continued on following page)

AIRWHEEL* NOW GOES INTERNATIONAL!

Ships in Italian, Swiss and Japanese service now equipped with Airwheel* Tires and Airwheel Hydraulic Disc Brakes

THE softer, safer landing of the Airwheel is winning this famous Goodyear product widespread recognition on modern airliners.

Tests show that they operate perfectly with retractable landing gears, and as a matter of fact, when tires and gears are lifted during flight, the old question of wind resistance is no longer a factor.

New Savoia-Marchetti—Italian ship, equipped with 35x15-6 Airwheel Tires and Hydraulic Brakes

It is worth while knowing, also, that the number of Goodyear Airwheels now in use on automobiles is *five times* that of all other super-soft tires combined—and with this spreading popularity on passenger cars, the name Airwheel becomes an increasing asset to passenger planes.

Why not have this asset on your ships? Write Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

New ships of this type, built by General Aviation Manufacturing Corporation, are now in use by the Swiss Air Company of Switzerland and Mitsui of Japan. Another ship is now in use by Western Air Express. All use Airwheel equipment, including both front wheels and tail wheel, and Airwheel Hydraulic Disc Brakes

When you buy a new ship specify the Goodyear Airwheel and the new Goodyear Hydraulic Airwheel Brakes

* IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL! AIRWHEEL is Goodyear's trade-mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of AIRWHEEL Tires

(*Continued from preceding page*)

so we could get a breath of air from the river, mixed with the pleasant aroma of a nearby brewery. The window stuck, and I said "You should have an Assistant Vice-President to open windows for you so you won't lose your dignity." He saw I was kidding him and laughed. "Don't take that title seriously. A Vice-President is just a fellow who carries bags for the President; he's a sort of caddy. There used to be a lot of them around a few years ago, but they gradually died off."

Well, we chatted along, nice and friendly, and I asked him a lot of questions and he answered all of them. He has as many ideas as his father has college professors on the public pay-roll. Some of those ideas are of the rosy variety common to optimistic and somewhat idealistic young men of 23, while others are soundly practical. In fact, what impressed me most about him, next to his friendly and ingratiating manner, was his shrewd common sense and his remarkably adult views about politics and aviation, about both of which peculiar sciences he has pronounced opinions which he states with emphasis. Whatever he may accomplish in the Chamber of Commerce, I'm convinced of one thing: he won't act as a complacent rubber stamp for other people's ideas; he has some of his own, and in the main they seemed pretty sound to me, although I don't hold with all of them.

We've Got a Democrat

He believes rather more firmly than I do in his father's policies. As I was there to ask questions, not to argue, we didn't tear into each other about politics; but I was itching to have at him with a few facts bearing on the New Deal, for I have a firm idea that some cards have been dealt from the bottom of the deck when we weren't looking—the air mail cancellations, for instance. As Elliott only spent part of a Fall term at Princeton, I don't suppose he studied much ancient history, and he's been too busy to delve into it since then. But if he has time to glance through Edward Gibbon's *Decline and Fall* he may be startled to learn that about the same sort of deal was handed to the mobs of the Roman Empire, with free bread and free circuses at the taxpayers' expense. The old Romans finally reached a point where they had more bums than they had taxpayers; and the surviving Romans never got anywhere until several centuries later when they emigrated to America and opened fruit stands and shoe shine parlors. However, we wanted a Democrat and we've got one. I'm glad he has a good paying job, because it's young men like Elliott, and his children and his grandchildren after him, who will have to pay for the New Deal which his father is dealing out, entirely on credit. All I hope is that we don't run out of taxpayers by the time I get too old to do anything but clamor for Relief myself.

Elliott Roosevelt was born in New York City Sept. 23, 1910, educated at the National Cathedral School in Washington (while his father was Asst. Secretary of the Navy) and at the Groton School, Groton, Mass. After part of a term at Princeton he decamped from that fount of learning over which the martyred Woodrow once presided, because he figured that about all he would learn would be athletics. So he escaped the dire influence of the professors, thus being one step ahead of his own father, who fell for their hocus-pocus late in life and now is as cursed with a horde of them, as a dog is with fleas.

Well, a Job's a Job

Elliott got himself a job with Albert Frank & Co., financial advertising agency, doing clerical work during 1930 and '31, when with James Nason and Jack Kelly he formed the advertising agency of Kelly, Nason & Roosevelt. They sat at desks month after month, getting no business, and finally to ease the strain Elliott got out and went with the Paul Cornell agency in 1932. The moment he left, the firm got business and is now doing well. He hasn't anything to do with it now, but his name is still used as he was an original partner. While with Cornell, Elliott did a survey of Trans American Airlines for E. L. Cord. He was assisted by Eugene Vidal, who now sits in Washington yearning for a vestpocket airplane for $700. Later in 1932 Elliott went to the Pacific Coast as temporary general manager of Gilpin Airlines which Mrs. John C. Greenway (now representative in Congress from Arizona) had financed. Elliott studied the line and advised Mrs. Greenway to close it up, which she did with a sigh of relief, for it had proved an expensive experiment.

While he was at school, some of Elliott's friends built an airplane out of old parts and he got some dual in that dubious creation. Then, while in Los Angeles, he took a student's permit, got in some more dual, and went solo for ten hours. Then an important job came his way and he never got time to take out a license. However, he piled up another 65 hours solo on his student's permit and now is determined to take time off to get a private license.

The important job I mentioned was with the Hearst papers. In the summer of 1933 Elliott met William Randolph Hearst and suggested to that shrewd publisher that the Hearst papers would be better if one, Elliott Roosevelt, wrote an aviation column for them. What, demanded Mr. Hearst, did young Mr. Roosevelt know about aviation? Very little, said Mr. Roosevelt, but he was anxious to learn, to write down what he had learned, and to get paid for it. The idea appealed to Mr. Hearst, who must have known that it wouldn't do any harm to his circulation to have a son of the President writing for him, no matter what he wrote or how badly he wrote it. So Elliott became a syndicate writer, like Arthur Brisbane and Beatrice Fairfax, both of whom have gone far and made much money on two chief subjects—the Japanese menace and love. Elliott stuck to aviation and wrote a pretty good column.

While he was with Hearst, Elliott covered 150,000 miles by air in a year, and on a Hearst expense account, which is a very nice way to travel. He studied air transportation and visited the factories and got to know many people in the industry. Mr. Hearst played the part of Santa Claus. Then came the air mail fiasco, which put Elliott in a difficult position. Mr. Hearst's editorial writers were thundering away about the iniquity of crucifying these mail contractors, and Mr. Hearst's aviation expert was expected to do likewise. Yet while Elliott felt that the President had been badly advised and had made a mistake, he could not very well attack his own father's policies in the public press. He was in a tough spot, and it is an illuminating comment on the young man's boldness and resourcefulness to learn how he extricated himself.

He went to Mr. Hearst and said: "I don't think that father has had the right advice on this matter. If you'll charter a plane I'll fly to Miami and see what I can do." This idea appealed to Mr. Hearst, because he naturally liked to be in the position of having one of his employees giving advice to the President. He was always giving advice himself, and nobody was taking it, so he thought it worth trying to learn if one of his writers could get his advice taken.

Crashing the Party

So Elliott and George Hearst took off for Miami, where Elliott met his father, who was cruising around on a fishing and loafing trip with Vincent Astor—which was a lot cheaper for the taxpayers than having to steam up one of the Navy's cruisers for him, just so he could catch himself a sea bass and a couple of flounders. Well, Elliott didn't get much change out of the President, who, like all fathers, didn't take a lot of stock in his own son's ideas. He just said that Elliott should go see some Cabinet officers and tell his story to them. "Now, if you'll excuse me," said his father, "I'm busy with this fish."

He saw the Cabinet officers and spoke right up to them, too. Perhaps his intervention hadn't much effect on the ultimate outcome, but it serves to show the stuff he's made of. Of course, you can

(*Continued on page* 53)

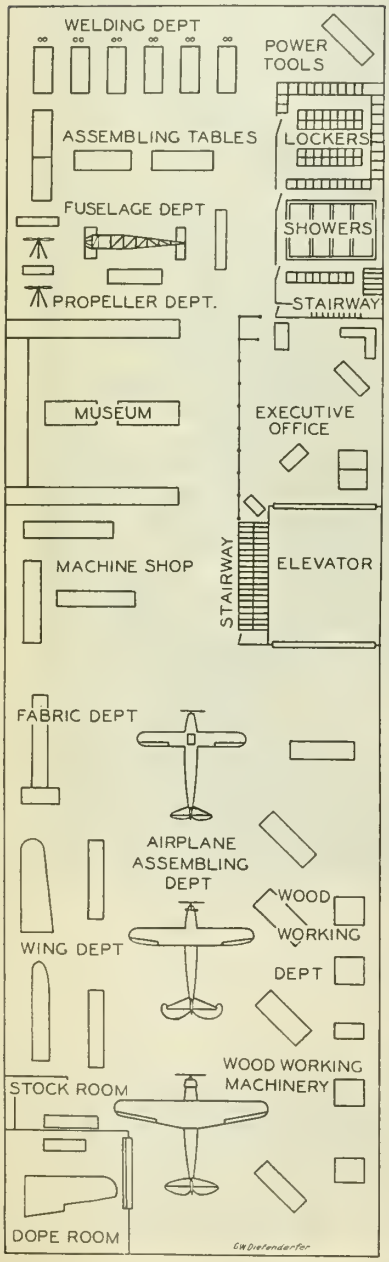
Hamilton Standard Controllables are in use by, or on order for, the following airlines: A. B. Aerotransport (Swedish) • Aerovias Centrales S. A. • Air France • American Air Lines • China National Aviation Corp. • Deutsche Luft Hansa, A. G. • Eastern Air Lines • Japan Air Transport • LOT (Poland) • Northwest Air Lines • Pacific Alaska Airways • Pan-American Airways • Pan-American-Grace-Airways • Royal Dutch Airlines (K. L. M.) • Swissair • TWA, Inc. • United Air Lines.

HAMILTON STANDARD
EAST HARTFORD
CONNECTICUT
SUBSIDIARY OF UNITED AIRCRAFT & TRANSPORT CORPORATION
PROPELLER COMPANY

HAMILTON STANDARD

CONTROLLABLE PITCH PROPELLERS

Casey Jones (extreme left) and his faculty at the Casey Jones School of Aeronautics in Newark, N. J.



Floor plan of the lower floor of the school's new building, showing location of various units and departments

Training Aviation Mechanics and Engineers

CHARLES S. (CASEY) JONES
President, Casey Jones School of Aeronautics, Inc.

● In the Fall of 1932, a group of five men, all with long aviation experience, decided that a school which gave sufficient mechanical training to qualify its graduates for their Department of commerce license would be of inestimable service to the industry. They believed that such training would offer to those wishing to make aviation their life work the best possible method of entering the industry. They thought that courses should be of sufficient length to give basic mechanical training and that the instruction should be entirely practical. With these purposes in mind they organized the Casey Jones School of Aeronautics and located at Newark, New Jersey, home of one of the world's busiest airports.

Faculty and Facilities

The five organizers were: Lt. Col. George A. Vaughn, Jr., graduate of Princeton University, second ranking American ace during the war, Air Officer of the 27th Division National Guard, and president of Eastern Aeronautical Corporation which for a number of years has operated the service concession at Newark Airport; Lee D. Warrender, graduate of Purdue University and Massachusetts Institute of Technology, World War pilot, and widely experienced in the care and servicing of airplanes and engines; Richard Whatham, authority on meteorology and formerly associated with the Royal Naval Service and the United States Air Corps; B. Hunt Smith, well-known sportsman pilot; and the writer, who has long been associated with military and commercial aviation, particularly in the instruction field.

The school started in three good-sized rooms and a hangar at the Newark Airport used in conjunction with Eastern Aeronautical Corp. A group of licensed mechanics was secured as instructors, including George Lawton and Gordon Hamilton, both men of long experience; Clayton Bedford, formerly service engineer with the Wright Aeronautical Corporation and a graduate of the University of Columbia; and Thomas Schlitz, a welding expert.

Three months after opening, it was necessary to double the floor space to accommodate an increasing number of students. Then a two-year course in aeronautical engineering was added to the curriculum, combining the master mechanics course with a thorough course in engineering, under the direction of Warrender and Walter M. Hartung, graduate of New York University and formerly assistant engineer of the Granville Brothers Aircraft Company. The welding course, which started separately, was combined with the regular mechanics course.

Towards the end of June, 1934, the existing quarters were again found inadequate, necessitating a third expansion and two complete floors, occupying 32,000 square feet of floor space in a modern fireproof building were taken over to meet the requirements necessitated by an increasing enrollment.

The new building is ideal for school use. On the top floor are two lecture rooms with offices for instructors and a large assembly and recreation hall. Behind these are the drawing boards and desks for the Junior and Senior engineering departments. In the rear is the engine division and its several departments, including primary and advanced engines, ignition, carburetion, inspection and instruments. Sixteen aircraft engines are

located in separate bays flanked by overhaul benches.

The executive offices, together with the welding and propeller departments and an aeronautical museum are at the front of the second floor. The rear of the floor is devoted to the airplane division with sufficient space for assembling four airplanes at one time. The panelling, woodworking, metal working, and fabric departments are situated in bays along the side of the room, and in the rear corner is the dope room with double fireproof doors, fireproof walls and provision for special ventilation.

Methods of Instruction

Adequate locker space is available on both floors as well as washrooms, showers, etc., while a large elevator facilitates movement of planes and engines between departments. Ample stock rooms are located on both floors.

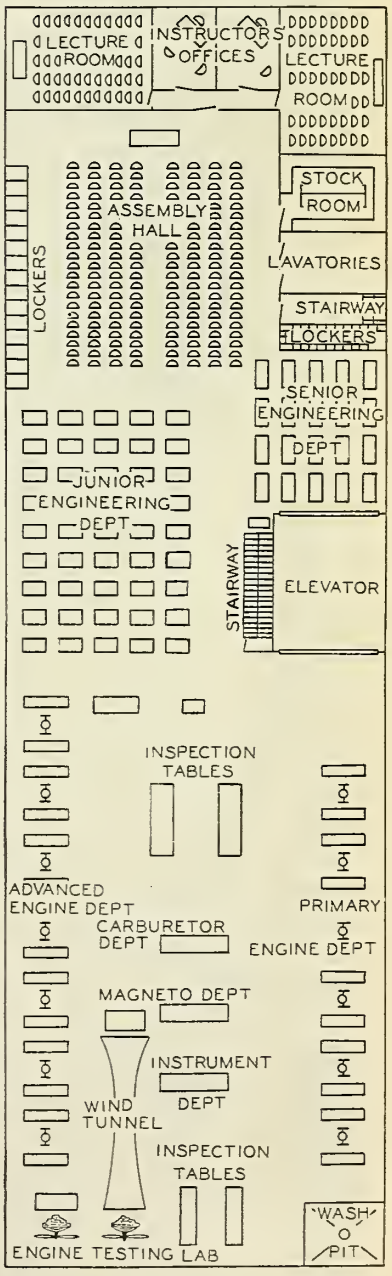
The school offers two courses; the master mechanics' course requiring fourteen months (two years, night school), and the two-year aeronautical engineering course (two and one-half years, night school). Graduates of both courses are qualified to take their tests for airplane and airplane engine licenses granted by the Department of Commerce. During the first six months the work in both courses is identical, being devoted largely to providing a basic mechanical training. Students are taught the use of tools, woodworking and metal, and each one is required to learn how to build, cover, dope and repair a wing section. He then progresses to wire splicing, rigging and assembling. In the engine department the process is the same, starting with elementary engines and proceeding to the overhauling of modern engines.

After the first six months, the work in the two courses follows different patterns. In the master mechanics course, the student continues with his practical instruction, completely overhauling Wasp, Hornet, Whirlwind, Cyclone and Conquerer engines and also specializing in ignition and carburetion. He is taught to become familiar with numerous aircraft instruments and accessories, their care, upkeep and repair. He spends several months in the hangar at Newark Airport, where he learns field practice, trouble-shooting and general airplane operation. There, where all the major airlines have their eastern terminii, he is given first-hand opportunity to observe modern airline operations on a large scale. The entire course is designed to give the student training similar to that which he would receive if he were working at an airport or in an aircraft factory.

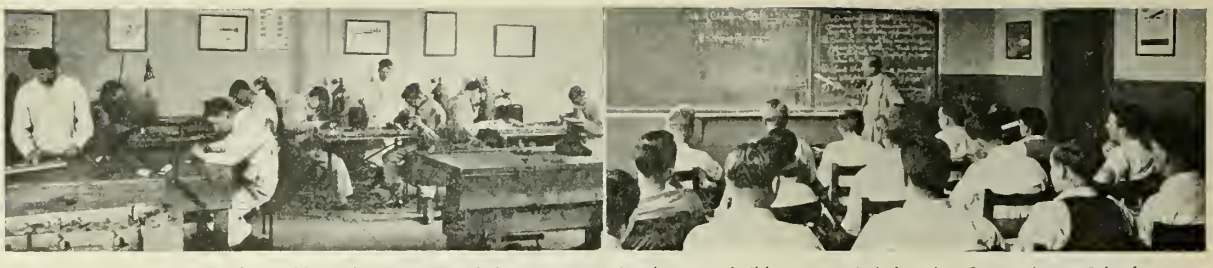
After the first six months, the engineering student commences his engineering subjects, which are given in coordination with his mechanical training. Theory of flight, advanced mathematics, aerodynamics, mechanical drawing, drafting, stress analysis and kindred engineering subjects are carefully covered. At the same time, the student is required to put into practice in the shop, the theories which he is learning. The complete engineering course covers approximately 3,000 hours and the subjects are comparable to those given by a university offering an aeronautical engineering degree. As classes are held five days per week and vacations are of short duration, it is possible to thoroughly cover the ground in two years.

In order that the instruction may be practical, the school either purchases wrecked airplanes and rebuilds them or repairs privately owned airplanes that need overhauling. In selecting such airplanes, care is exercised not to compete with local service stations. These machines are disassembled at the field hangar, brought to the school and there the necessary work is accomplished by the students under the supervision of the instructors. When completed, the planes are taken to the field, assembled, inspected, tested and flown. It is not uncommon for the school to completely rebuild airplanes and on one repair job during the past year, seven new wing spars were constructed by students, an indication of the extent of the work undertaken. Among the different planes

Above: View of the engine division. Below: Engineering students at work on the drawing boards



Layout of upper floor, showing position of various departments and of lecture and study halls



General views of the welding department and lecture room in the new building occupied by the Casey Jones School

overhauled have been Wacos, Travel Airs, Stinsons, Eagle Rocks, Robins, Fledglings and Moths. In most cases, the engines in these planes are given a complete overhaul while the plane is in the school.

In order that each student may receive instruction on the types of engines used by the airlines and commercial operators, the school owns sixteen different types, including Whirlwinds, Wasps, Hornets, Cyclones and Conquerors, the assembly and overhaul of which are part of the required work.

In addition to practical instruction, a sound foundation of general aviation knowledge is provided by lectures sufficient to meet the ground work requirements of the Department of Commerce for any grade of license. Navigation, meteorology, history of aviation, airline operation, field management are all included, as well as rules and regulations of the Department of Commerce.

The school conducts a placement bureau which keeps close contact with manufacturers, operators and airlines. One of the encouraging factors at the present time is the growing recognition that graduates of well-conducted schools are receiving from these other branches of the aviation industry. It is felt that the policy of specializing in developing practical mechanics and engineers instead of attempting to provide this training as an auxiliary to flight instruction is partially responsible for this recognition. There are other causes. In the last few years there has been a marked improvement and a great increase in the use of metal in airplane construction. New metals have to be handled by new methods. It is no longer possible for the ordinary welder to do the highly skilled welding now necessary in handling duralumin and other new metals. Fabrication and repair demand a new technique. Consequently, specialized training is required.

Airline and airport operators are beginning to realize that graduates of good schools provide the best possible recruits for their organizations. Until recently many operators have expressed a preference for untrained, but willing youths, on the theory that such men could best be trained in the routine of an organization by the organization itself. This is true only when the aviation schools fail to do their jobs. In the first place, such training is costly. It is a recognized fact that a man serving an apprenticeship is at the start an expense to his employer. No matter how willing he may be, he is bound to make mistakes while learning.

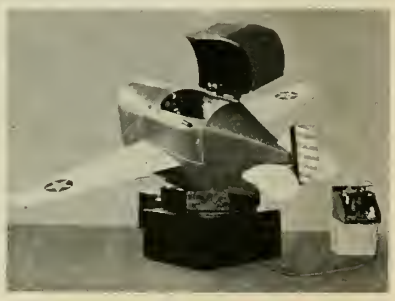
Instrument Flying

It has already been stated that the work of the school has been primarily devoted to training mechanics and engineers. No elementary flying instruction has been attempted. Flight training for those who desire it is provided through other organizations at the Newark Airport.

However, in order to keep abreast of the latest developments in flying, the school has perfected a system of instrument and radio beam instruction in conjunction with E. A. Link, inventor of a training device which materially decreases the cost of such instruction. The Trainer is mechanically operated by an electric motor, air pump and a series of valves which are actuated by a stick and rudder causing the Trainer to perform various maneuvers just as an airplane. It is completely equipped with navigation instruments, including bank and turn indicator, rate of climb, air speed, and compass. The cockpit is enclosed by a hood so that the student can be taught to fly by instruments and experience all the sensations of flying, without ever leaving the ground. In addition, an ingenious radio-sending device, which automatically transmits the same signals as those sent out by the radio stations on the airways, has been installed. The pilot in the Trainer, through his earphones, is able to pick up these radio signals which are sent to him by the instructor, and thus not only learn to fly by instruments, but also to fly the radio beam and to orientate himself under conditions similar to those encountered in the air. It has been definitely proven that the use of the Trainer decreases the flying time necessary to acquire proficiency in this type of flying by more than 50 per cent. The U. S. Army Air Corps, after exhaustive tests, purchased six of the Trainers, and others have been sold to the U. S. and Japanese navies. This instruction, which is offered only to pilots, is given at the New York quarters of the school at Radio City, 1250 Sixth Avenue. Flight instruction is conducted at Newark Airport and equipment kept in condition by the students under the direction of licensed mechanics. Thus, though the school does not provide elementary flying instruction, it is in a position to expand into this field as soon as the demand for such instruction seems to warrant it.

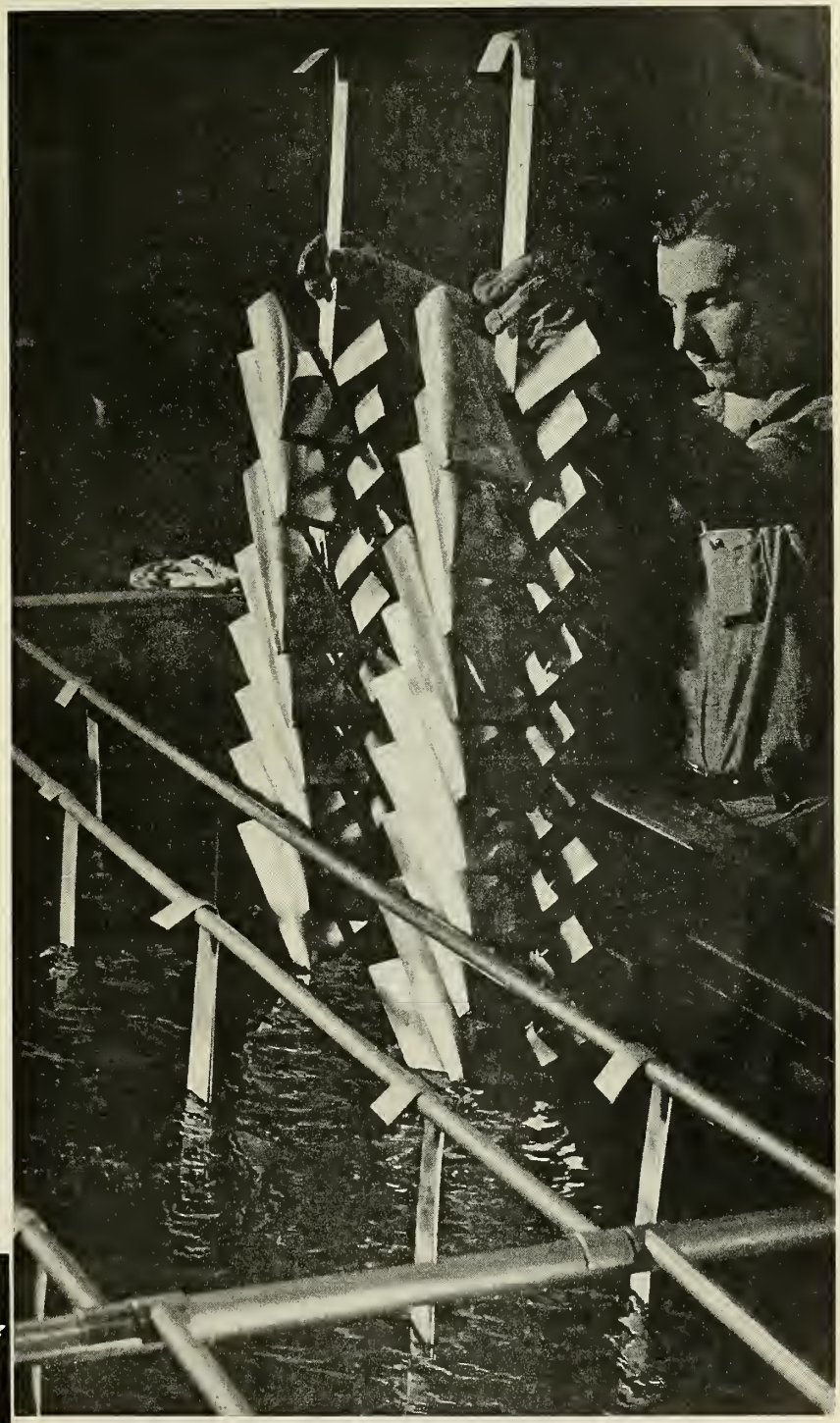
There is no question but there is a place in aviation for good schools. A nation progresses in direct proportion to the educational facilities provided its citizens. The same may be said of an industry, particularly one as highly specialized as aviation. Much progress has been made during the last few years, that, in part, can be attributed to increased knowledge within the industry and the growing confidence of the public.

Paint and dope department



The Link Trainer for blind flying

NEITHER SUN NOR RAIN . . .



Corrosion, arch enemy of metal, shies from Boeing planes. The most modern treating methods guarantee protection from the elements, whether wind, sunshine or rain. Boeing Airplane Company, Seattle.

BOEING

• • BOEING HAS ALWAYS BUILT TOMORROW'S AIRPLANES TODAY

Personalities

by Caldwell

● JOHN HENRY WRIGHT, after being born in Clark Mills, N. Y., of all places, attended Clarkson Tech at Potsdam, N. Y., where he became something of an athlete and under an assumed name played pro basket ball. Any young gentlemen who played against Mr. Wright in the days of his youth doubtless will remember it to their dying day, for he has a pair of shoulders about a yard and a half across, is stocky and meaty, and would be a rather awful creature to get in the way of. If someone said to me, "Do you want to withstand a determined charge by Jack Wright, or do you prefer that this rhinoceros here should go after you?" I'd say at once, "Unchain the rhinoceros!"

After hurling unoffending basket ball players out of his way for some time, Mr. Wright accepted an invitation from the United States Government to join the N. Y. National Guard, in order to bring that organization up to strength, for it had been short six men. In 1916 Mr. Wright was a sergeant, and a tough one he must have been; they sent him and the Guard with old Massa Pershing down in Mexico to round up one Pancho Villa, who had been cutting up didoes and annoying Americans along the border. Unfortunately, Mr. Wright never got near enough to Mr. Villa to fall on him, or that worthy would have ceased functioning immediately.

In the cause of democracy, which bobbed up a year later, Mr. Wright joined the 28th Division as machine gun officer, though a howitzer would have been nearer his size. If they simply gave Mr. Wright a Naval 12-inch gun and told him to shoulder it up to the front lines, and then hold it like a shot-gun and open fire, the war would have ended a month earlier. He had a lot of fun shooting up Germans until one of them got fresh and shot him up on July 18, 1918, at a doleful tank town called Fismes, France, a sort of out-house behind Chateau Thierry.

Jack Wright was given recuperative leave and went to Issoudon where he received flying instruction. By March 13, 1919, he had recovered sufficiently to marry an American nurse, also lost in France, a Miss Argyle Trevillian Tutwiler, from Richmond, Virginia, Suh! By now Jack probably knows her well enough to call her Aggie, or possibly Tut. They give those Southern girls very fancy names which are positively staggering to us foreigners up North. An old married man, Jack Wright staggered back to America and sold insurance in the rising town of Utica, N. Y. when his interest in aviation seduced him (I think seduced is the word) into flying. He became Utica manager for Colonial Airways, later American Airways. This experience made him so desperate that he went in for airplane racing as a sportsman pilot, winning 130 trophies and everything except a living. Finding that the trophies weren't fish-cakes, Jack went back to insurance for a living, racing occasionally in an OX-5 Challenger and a KR 34, until Don Luscombe brought a Warner Monocoupe to his attention. This really started Jack off on what is laughingly called the road to fame, for he copied everything Johnny Livingston had done, except staying out nights, and made that the fastest Monocoupe that anyone except Livingston ever had. He won the second Leeds Trophy Race, New York to Cleveland, 1931, the Mexican Government Trophy at Miami Races, 1932, and captured the world's record for ships of the first category at Miami in 1934, with a speed of 169.8 m.p.h.

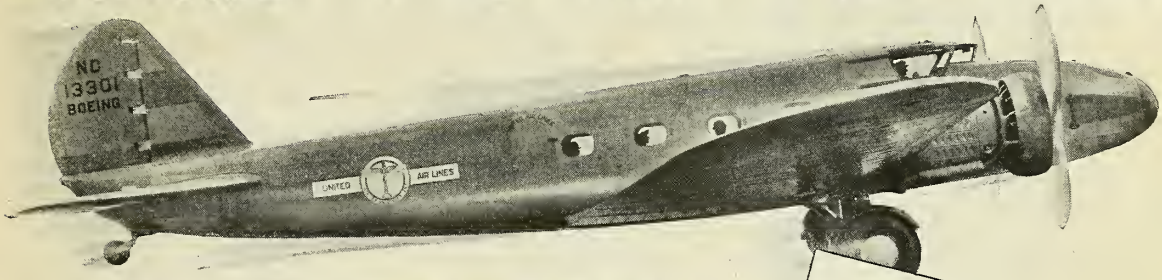
Then he got tired of copying Johnny Livingston and bought his clipped wing Monocoupe-a-la-Livingston, an entirely new species of airplane for which the Monocoupe people are only partly responsible. It is this snappy contraption, restressed for a 145 H.P. Warner, completely rebuilt at the Monocoupe factory, and approved by the Great Omnipotent Oom, or Dept. of Commerce, which Jack has entered in the London to Australia Air Race. He has toured the country with American Air Aces, has endured many hardships and therefore is tough enough to negotiate the hazards of a ten thousand mile race.

Jack Wright and the Monocoupe he has entered in the London-Melbourne air race

● BECKWITH HAVENS, Eastern District representative of Fairchild airplanes, has been in aviation for nearly a quarter of a century, starting with Glenn H. Curtiss at Hammondsport in 1910. He is now practically a sacred relic of the early days; if he lasts a few years longer some historical research society will come along and nail a bronze tablet on him, like they do on those old houses where George Washington slept a night. In fact, Beckwith lives in an old house in the rural regions of Long Island where George

(*Continued on following page*)

15 MILLION MILES
—THOUSANDS OF SAFE LANDINGS AND TAKE-OFFS



One of the United Air Lines' giant "247's" in flight

UNITED AIR LINES PROTECTS PASSENGERS WITH GOODRICH LOW PRESSURE TIRES

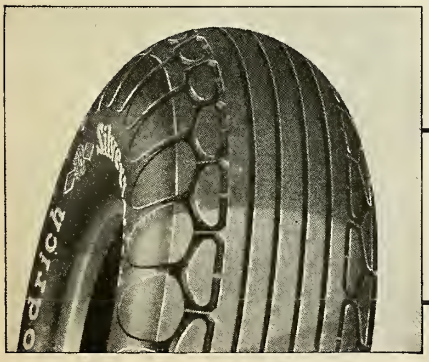
HIGH SPEEDS. Fast schedules. All types of airport construction to be safely negotiated. That's what Goodrich Airplane Silvertowns were up against when selected for coast-to-coast runs on United Air Lines.

Since the new Boeing 247's went into service for United Air Lines, they've flown more than 15 million miles — approximately 600 times around the earth. Thousands of safe landings and "take-offs" tell their own story of how Silvertowns can "take it." They're stronger — tougher — yet made for those soft, feather-bed landings the air-wise traveler demands these days.

Silvertowns for Safety and Comfort

Decide now that you'll give your passengers — your ships and cargoes the complete safety and comfort of Goodrich Airplane Silvertowns. See your nearest Goodrich dealer without delay, or write Dept. 427, Aeronautical Division of the B. F. Goodrich Rubber Co., Akron, Ohio, for complete information about Goodrich Airplane Products.

NRA MEMBER U.S.A. WE DO OUR PART



Whenever you fly, look at the tires. See how many times you take off on Goodrich Airplane Silvertowns

AN AMAZING RECORD!

The B. F. Goodrich Rubber Co., Akron, Ohio.

Gentlemen:

I am pleased to advise you that during a year's operations of our large fleet of Boeing Model 247, low-wing, all-metal transports, we have received excellent service from the Goodrich Silvertown Tires with which these planes are equipped. Since we inaugurated the world's fastest multi-motored service on our New York-Chicago-Pacific Coast and other airways last year we have flown the new type transports approximately 15,000,000 miles. Our coast-to-coast airway involves the landing and taking off of aircraft at fields ranging in elevation from sea level to 6,000 feet, and representing practically every type of airport construction. Our pilots and operations officials advise us that Goodrich Tires have contributed much to the unusually smooth landing characteristics of the transports.

Very truly yours,

D. B. COLVER, *Vice-President In Charge of Operations*

One of the Goodrich Airplane Silvertowns that are standard equipment on the United Air Lines 247's. Note its size as compared with the "Flying Silvertown" for automobiles.

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes—including Tires—Tail Wheels—Abrasion Shoes—De-Icers—Matting —Rubber Hose—Grommets—Shock Absorber Cord—A Complete line of Rubber Aeronautical Accessories.

(*Continued from preceding page*)

Washington might have slept—allowing that he didn't mind drafts. It's one of those enormous wooden mansions which our ancestors built because they had a lot of wood and didn't know quite what to do with it. Last winter, Becky tells me, he shovelled 25 tons of hard coal into the furnace. You had to be careful entering the front door while he was stoking, for the draft would hurl solid unburned chunks of coal up the chimney, from which it would rain down on the roof, hit the porch, and then bounce off the head of an incautious visitor.

Beckwith, or "Becky" Havens was born in New York City in 1890, the son of a lawyer. Lawyer's sons inherit such a powerful jaw development that they can talk for hours without tiring; so with this natural gift there was just one thing for Becky to do—become a salesman. He got a start in 1909 in New York as a retail automobile salesman, selling E. M. F. and Flanders cars to people who still believed that one or two horsepower was plenty. In 1910, stimulated by the balmy air of California, to which he had emigrated to sell Haines automobiles, Becky became balmy enough himself to start out as the world's first airplane salesman. He returned to New York and had charge of the Curtiss exhibit in the city's first airplane show. At that time, 1910, it would have taken four radio announcers, two used car salesmen, and a shot of ether to sell one airplane. None were sold, so Becky thought he might do better if he learned to fly the product.

He went to Hammondsport, met Glenn Curtiss, and sold that pioneer the idea that an airplane salesman should be taught to fly at the company's expense. In 1910 there were no dual Curtiss airplanes, so the flying "instruction" consisted of a few well-meant words of advice on the art of maintaining a desired elevation above the earth's surface without ending in an undesired excavation six feet below that surface. Becky received some ground instruction from Lt. "Spuds" Ellyson, the first Navy flyer, who was six months ahead of any one else in the Navy to fly. At Hammondsport in 1910 were also Lieut. (now Captain), J. H. Towers, the second Navy flyer, and Lieut. MacElvane, the first flyer of the U. S. Marine Corps. This distinguished group learned to fly under Mr. Curtiss' ground instruction. They were told which way to turn the wheel and lean on the shoulder yoke in order to go to the left or right, and how to push or pull on the steering column in order to go down or up. When they learned the difference between "switch on" and "switch off" and which way to move the throttle, they were considered to be sufficiently instructed and were turned over to God and the elements. Becky Havens learned under this rigorous method, went solo and survived the experiment. In fact, his first solo flight was an exhibition date.

Beckwith Havens

During 1911 Pilot Havens learned that trying to sell an airplane to the general public was about as easy as selling a Frigidaire to an Eskimo, so he joined the Curtiss Exhibition team and flew for them as an exhibition pilot until the end of 1913, winning many prizes and awards, including one from the City of Havana for the first flight over that city; and a gold medal from Curtiss for the first long distance flight in a flying boat from Chicago to New York; and the Aero Club of America Medal of Merit for the outstanding achievement of the year—the winning of the Aero and Hydro Trophy and Detroit Country Club Trophy in the Great Lakes Race of 1913. There were over a dozen entrants in that race, including Glenn Martin, Tony Jannus, and Walter Johnson. Havens was the only one to finish, flying from Chicago to Detroit, via Mackinac, in 16 days

"Becky" Havens, pilot of one of the first Curtiss flying boats

Havens joined the Denby Motor Truck Co. in 1914, with a five-year contract as foreign representative, travelling in nearly every country in the world. He took a year out and served with the Naval Air Service as Special Duty and Test Pilot, starting with the rank of Lieut. (jg). He is now a Lieut. Commander in the Reserve. 1920 found him as Sales Manager with the Curtiss New York Corporation. By 1920 an airplane could be sold without the use of an anaesthetic; or without even tapping the prospect firmly over the head with a sledge hammer to render him unconscious. One man was even discovered sneaking up on a used airplane and buying it without any urging by the salesman; but as his family shortly afterward had him committed to an institution for the cure of nervous and alcoholic cases, perhaps we shouldn't count that.

A bad tooth-ache sent Becky to a dentist in 1921. The dentist, a heartless fellow like all of his tribe, gave Becky gas and extracted a wisdom tooth. Whether it was the gas or the loss of the wisdom tooth I don't know, but the upshot of it was that, with C. C. Witmer, Becky organized the Airship Manufacturing Co. of America to manufacture lighter-than-air craft and accessories, changing the name in 1924 to Airships, Incorporated. They manufactured dirigible airships of various types, including the Zodiac, MB, TC, and TE, kite balloons, and free balloons. The Army and Navy are still wondering what to do with them. Perhaps the coverings could be used as canopies over open-air beer gardens, and the gondolas and baskets could be equipped with wings and entered in Gene Vidal's $700 airplane competition (just a suggestion). Driven to desperation by all these balloons, Airships, Inc., built emergency flotation gear, safety belts, other belts, wind cones, ice-cream cones, and such supplies until the time when the company was liquidated.

Becky was Sales Manager and Test Pilot of Loening Aeronautical Engineering Corporation until 1929, when Loening sold out to Keystone. In 1930 Havens made a trip through Central and South America and the West Indies, mostly by Pan American Airways, as assistant field director of the Fort Ticonderoga Museum. They were searching for old bronze cannon and new Bronx cocktails, and collected both in profusion. Next year found him Aviation Specialist with Vacuum Oil Co., his duty being to sit in the exact center of a partial vacuum and look vacant and preoccupied, like all aviation specialists. Tiring of this, he joined Fairchild as Eastern District Representative with headquarters at Roosevelt Field.

ANOTHER TRIUMPH FOR BELLANCA DESIGN

1934 Bellanca Skyrocket De Luxe loafing along over South Jersey country at almost three miles per minute.

in the new Senior series for 1934

-THE "Load Compensator" LANDING GEAR!

IN America's dramatic conquest of the air, Bellanca has played a leading role. To Bellanca, Aviation owes the origin and commercial introduction of the cabin plane. Aircraft design was revolutionized by the tremendous increase in lifting power demonstrated by the Bellanca wing. To the many successful long-distance, endurance and efficiency contest flights of Bellanca planes, aviation attributes much of the credit for establishing the commercial practicability of flight. And this year, Bellanca incorporates in the Senior Pacemaker and the Senior Skyrocket for 1934, a feature which is destined to become a significant step in the direction of aeronautical progress—the "Load Compensator" landing gear.

You'll want complete information about this new feature and the very apparent superiority it offers in landing ease, manipulation on the ground and greatly increased flying speed. Illustrated literature is available.

BELLANCA AIRCRAFT CORPORATION
New Castle, Delaware
Bellanca Aircraft of Canada, Ltd., Montreal

Although this revolutionary landing gear design is a development of far reaching significance in aviation, it is not the only improvement embodied in this splendid Bellanca series for 1934. Present ships contain a baggage compartment which will easily accommodate half a dozen large-sized travelling bags. The pilot's window is clear-vision, streamlined to the cowling and cleverly arranged to permit proper ventilation without draught. Cabin ventilation and heating is provided by means of a draughtless duct system entirely new to cabin plane design.

Complete specifications and performance data sent upon request.

BELLANCA ★ *The Senior Pacemaker* *The Senior Skyrocket*

Air Express Links 30 Nations

AFTER THREE years of negotiations with the governments of 30 Central and South American governments, a door-to-door express service between the United States and 150 cities in those territories, went into effect the first of this month following the signing of contracts between Pan American Airways and the Air Express Division of Railway Express Agency.

The new shipping system, which cuts red-tape by the use of a single waybill instead of six ordinarily required in foreign shipping, gives to business men in the countries effected the same facilities now available within the United States.

According to Juan T. Trippe, president of Pan American Airways, express formerly held up for weeks and months will now pass through the customs of these countries as fast as the luggage of passengers—in 12 hours or less.

Air Transport Board Appointed

GENERAL HUGH Johnson has approved the choice of seven members for the Code Authority of the air transport industry.

Five chosen by the Aeronautical Chamber were E. R. Breech, president of North American Aviation, Inc.; H. S. Martin, president of Pennsylvania Air Lines and Transport Corp.; W. A. Patterson, president of United Air Lines, Inc.; L. D. Seymour, president of American Airways; and J. T. Trippe, president of Pan American Airways.

Temple Bowen, president of Bowen Air Lines, and T. E. Braniff, president of Braniff Airways, Inc., were also approved as members of the board.

AIRLINES CARRY 35,899 PASSENGERS

EIGHTEEN airlines operating in continental United States carried 35,899 passengers in May, 1934, flew 2,699,342 miles, carried 153,331 pounds of express and flew 14,408,-909 passenger miles. A year previously when 27 companies reported, 38,738 passengers, 122,414 pounds of express were carried and 4,102,991 miles flown.

New England Service Augmented

ADDITIONAL PASSENGER and express service between Boston and Portland, Augusta, Waterville and Bangor, Me., has been inaugurated by Boston-Maine Airways. The new service makes two round trips daily by planes of the airways subsidiary of the Boston and Maine and the Maine Central railroads between those cities.

Tri-motored Stinsons leave Bangor at 7.45 a. m., Waterville at 8.15, Augusta at 8.30, Portland at 9.15, and arrive in Boston at 10.10 a. m.

Eastbound, the plane leaves East Boston Airport at 3.40 p. m., Portland 4.50, Augusta 5.25, Waterville 5.40, with arrival in Bangor at 6.10 p. m. The eastbound plane connects by air from New York City.

Loading air express aboard a TWA Cyclone-powered Douglas transport

Hawaiian Air Mail Service Proposed

AIR MAIL service on the Hawaiian Islands may be inaugurated by the Post Office Department if reasonable bids are received.

This proposed service will link the four large islands of the group, Hawaii, Oahu, Kauai and Maui, and will embrace the principal cities of each, thereby serving 325,000 residents.

Advertisements for bids on this service have been issued to all airlines both in the United States and the Hawaiian Islands. Amphibions will be required for this service, which will be the first to be advertised under the terms of the recently enacted air mail legislation. Contracts will be let for a period of one year.

The proposed new Hawaiian Air Mail Service will embrace approximately 333 miles. The line will extend 108 miles west from Honolulu on the island of Oahu to Lihue on the island of Kauai. From Honlulu to the east the line will extend 102 miles to Maalaea on the island of Maui. From Maalaea the proposed route will continue 123 miles to the East and South to Milo on the island of Hawaii. The longest over-water stretch on the entire route will be 93 miles.

The only inter-island mail service now afforded residents of the Hawaiian Islands is a once-a-week ship mail service between some of the islands and a twice-a-week ship mail service between others. Under the proposed Hawaiian Air Mail system it is planned to schedule one round trip daily except Sundays and national holidays.

Airline Moves Miami Base

EASTERN AIR Lines, Inc., has moved its southern terminus from the Municipal Airport, Miami, Fla., to the Pan American Airport on account of convenience of location and to facilitate exchange of passengers, mail and express between its line and the Latin American schedules of the international route.

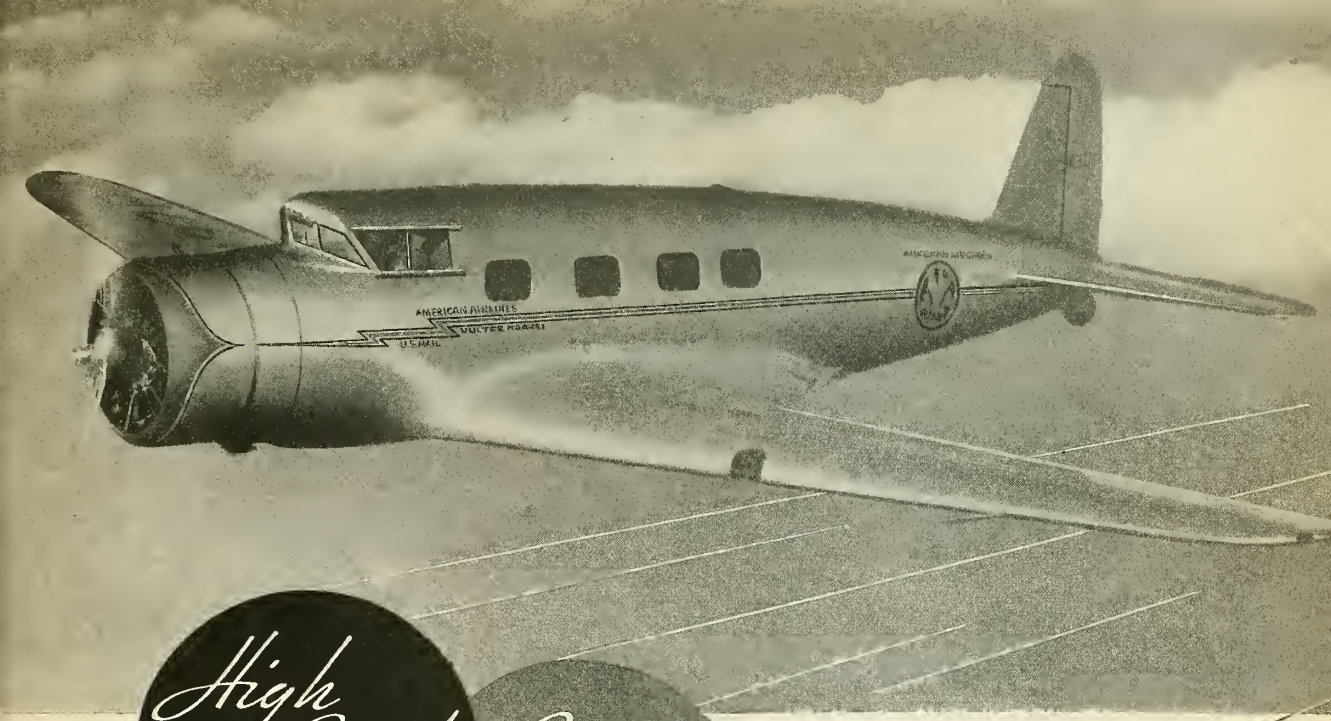
The company operates overnight schedules from New York and intermediate points which directly connect with Pan American Airways at Miami, allowing a continuous flight of 2,000 miles in 24 hours from New York to Haiti.

New Airline Operating

ISLAND AIRLINES, Inc., recently inaugurated air service between New Bedford, Woods Hole, Vineyard Haven and Nantucket. Four round-trips are made each day in a six-passenger P. & W. Wasp-powered Fairchild.

Officers of the company, which maintains its headquarters in New Bedford, Mass., are Robert Bell, president; Burnham Litchfield, vice-president, and Charles Ripey, secretary.

(*Continued on following page*)



High Speed **235 M.P.H.**

Cruising Speed **215 M.P.H.**

AIRPLANE DEVELOPMENT CORPORATION

Vultee V-1A TRANSPORTS

powered by WRIGHT CYCLONES

Wright Cyclone Engines power the new, 10-place Airplane Development Corporation V-1A Transports, which have a high speed of 235 m.p.h. and a cruising speed of 215 m.p.h. The outstanding features of these super-speed transports, which are soon to be placed in service on American Airlines, are as follows:

1. Exceptionally high top and cruising speeds and low landing speed.
2. Roomy and luxuriously furnished cabins designed to provide maximum comfort for passengers.
3. Low operating and maintenance costs made possible by simplicity of airplane construction and the use of a reliable and economical power plant—the Wright (Series F) Cyclone.

Twenty-two of the new V-1A, 10-place transports, powered by Wright Cyclones, are now under construction at the Airplane Development Corporation for American Airlines and other prominent operators. Wright Cyclones also power all of the new Curtiss-Wright Condor Day Planes and Sleeper Planes in operation on all of the main divisions of the coast-to-coast network of American Airlines—Chicago to New York, New York to Boston, Cleveland-Dallas-Fort Worth and Los Angeles.

WRIGHT

AERONAUTICAL CORPORATION

PATERSON NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

(Continued from preceding page)

Safety Standards To Be Discussed

EXTENSIVE CHANGES in the Department of Commerce airline regulations, to increase further the safety and reliability of scheduled air transportation, will be the subject of a conference to be held in Washington on August 15 and 16 between officials of the Bureau of Air Commerce of the Department and representatives of the scheduled air transport companies.

In calling the conference, Eugene L. Vidal, Director of Air Commerce, said that many revisions in the existing regulations are necessary because the rapid technical advances in airline operation since the requirements were first promulgated several years ago, have made them obsolete. Broader authority to provide standards of safety on the air lines was granted the Department of Commerce by Congress in an amendment to the Air Commerce Act of 1926 adopted in the concluding days of the last session.

It is hoped to receive valuable criticism and suggestions from the operators with respect to standardization of airway construction; radio, intermediate landing fields and beacon lights as now operated by the Department of Commerce and also with respect to the advisability of introducing such new devices as the radio compass, visual reception of radio range beacon signals, blind landing facilities and radio typewriters for the transmission of weather maps, weather reports and emergency messages.

With respect to regulation, efforts will be made to fit the requirements to the type of operations carried out. Not only will the airline regulations be brought up to date, but they will be localized as well.

Type of equipment suitable, and qualifications of personnel necessary in different localities will be discussed. The use of single or multi-engined airplanes and the types of operation for which each is suited, will be considered, as will also the performance which should be expected of a multi-engined aircraft in flight in case of engine failure.

Under the terms of the Air Mail Act of 1934, the Secretary of Commerce is authorized and directed to prescribe the maximum flying hours of pilots on air mail lines and also to approve agreements between air mail operating companies and their pilots and mechanics for retirement benefits. Provision will be made on the agenda of the conference for these subjects to be thoroughly discussed.

Bellanca Airbus seaplane used for New York—Long Island commuter service

TWA Reduces Flying Time

A REDUCTION of 4½ hours in the scheduled flying time between Los Angeles and New York together with the inauguration of a new air passenger and express service from Kansas City to New York via Chicago and Pittsburgh, was inaugurated recently by TWA., Inc.

The new service, providing fast schedules from coast-to-coast, is flown between Kansas City and New York with the twin Cyclone-powered high-speed Douglas Airliners, which cruise at about 200 miles an hour.

With the new schedules, TWA established a new transcontinental route in addition to the one the company was operating between Los Angeles and New York by way of Kansas City, St. Louis, Indianapolis and Columbus.

Through the use of the Douglas Airliners on the eastern half of the run. coast-to-coast time is now 20 hours 42 minutes and flying time from Kansas City to New York is 6 hours 37 minutes.

Commuter Service in New York

WALL STREET men living in Long Island can now fly to work every morning in aircraft operated by New York and Suburban Airways, Inc., which flies from Oyster Bay to the East River float at the foot of the famous street. A second service will go into effect from Glen Cove to Wall Street with an intermediate stop at Port Washington.

The line is the outgrowth of two years of private commuting from Port Washington by Richard C. Hoyt, who flew to work daily in his own plane which was piloted by Stanley C. Jacques, who has been appointed operations manager of the line. A Bellanca Airbus, equipped with floats, is being used.

France New Operations Manager

RECENT PROMOTIONS made by Eastern Air Lines included the election of Charles W. France, who had been serving as operations engineer, to the vice-presidency in charge of operations; George R. Cushing, vice-president, as general superintendent of the airline, and John K. Ottley, Jr., formerly southern division traffic manager, as assistant general traffic manager. Ottley is taking charge of traffic in all cities except New York, Newark, Philadelphia, Baltimore and Washington. The latter cities will remain under the general traffic office in New York, and Mr. Ottley's headquarters will continue in Atlanta, Ga.

Eastern Air Lines operates the New York-Miami, New York-New Orleans and Chicago-Jacksonville routes, carrying passengers, mail and air express over all divisions except the Chicago-Jacksonville route.

United Plans Speedier Schedules

EQUIPPED WITH geared supercharged Wasp engines and three-bladed controllable-pitch Hamilton Standard propellers, ten model 247-D Boeing transports will be delivered to United Air Lines commencing this month to make possible even further reduction of elapsed time on the coast-to-coast schedules over the mid-continent airway. Since it began operations, United has cut coast-to-coast time from 31 to 18¾ hours.

Although performance statistics on the new type 247 planes have not been released, the speed of the plane is substantially in excess of that of the present 247s now being operated. Except for nacelle changes to accommodate the geared engines, the external appearance of the 247-D is similar to that of the 247.

NEW

PIONEER

2 REVOLUTION

ALTERNATING CURRENT

ELECTRIC TACHOMETER

TYPE 840

★ Type 840 Electric Tachometer is Pioneer's latest contribution to safe flying. As in other instruments in the complete line, reliability and long trouble-free service have been built into the Type 840 Tachometer. The design employed eliminates many difficulties found in other tachometers of this type and offers the following advantages:

★ Employs no brushes, slip rings, sliding contacts or moving coils . . . thus eliminating wear and maintainance.

★ Does not require calibrated leads between Generator and Indicator.

★ Two full revolutions of the pointer for 3,000 RPM range gives an exceptionally open scale, insuring accurate reading for any working range.

★ Interchangeable . . . any Pioneer Indicator will operate accurately with any Pioneer Generator.

★ Withstands the most severe vibration in service . . . no special mounting or shock absorbers required.

★ Indicator and Generator are thoroughly compensated to operate accurately at temperatures from —60°C to + 45°C.

★ **Positive engine synchronization is easily secured by inserting three small lamps in the standard wiring system . . . no additional equipment required.**

PIONEER INSTRUMENTS

PIONEER INSTRUMENT COMPANY INCORPORATED

BROOKLYN · NEW YORK · A SUBSIDIARY OF BENDIX AVIATION CORPORATION

NEWS OF THE SCHOOLS

Parks Buys More Planes

THREE NEW planes have been ordered for student training and will be added to the present fleet of Parks Air College training planes as soon as deliveries can be made by the factories.

Two are Kinner Sportsters and the third is a 1934 Waco Cabin. The Kinners are to be used for primary training, while the Waco will be available for more advanced work.

The new regular term at the East St. Louis, Ill., school opened July 9, with many registrations made in all courses. It was pointed out that as a result of increased aeronautical production between 30 and 40 Parks graduates were placed in positions in one month.

Students to Design and Build Planes

ENGINEERING STUDENTS at Parks Air College, East St. Louis, Ill., assisted by the faculty, will design a complete ship embodying latest developments as well as new principles. Norman O. Anderson, Dean of Engineering, will have charge of design, but the entire engineering school will participate in development.

The ship will probably be of all-metal construction and be designed to meet or exceed Department of Commerce specifications, especially those proposed by Eugene Vidal, Director of Air Commerce for a small craft.

The new engineering building has been completely remodelled providing new and more spacious quarters.

New Aviation School Opens

WITH AN initial class of about 20 students, Pennsylvania Technical Institute School of Aeronautics, Hughesville, Pa., has inaugurated two-year mechanics and engineering courses.

Space has been taken in a large manufacturing plant, while flying instruction will be given at the local airport. Tests are to be conducted on a new-type plane which it is hoped to develop into a practical trainer.

Registrations for the second group will be taken some time next month.

Course Given in Welding Engineering

A SPECIAL five-day course in welding engineering is being offered in Cleveland by the John Huntington Polytechnic Institute in cooperation with the Lincoln Electric Co. The course, being repeated at this time due to increased activity in the welding industry and to demand for an intensive advanced training course, will be conducted once each month except during August of this year. This course will provide engineers, welding supervisors and foremen an opportunity for intensive study of the practical and theoretical sides of welding.

Day sessions will be held at the plant of the Lincoln Electric Company, which has offered the facilities of its welding school under the direction of Arthur Madson and Dean Newton, and the evening lectures and discussions at the Polytechnic Institute.

The course will cover the value and use of the shielded arc; calculation and distribution of stresses in welded joints; study of polarized light and rubber weld models; penetration; designing for arc welding; organization of welding departments and estimating welding costs, etc.

CASEY JONES SCHOOL MOVES INTO LARGER QUARTERS

THE CASEY Jones School of Aeronautics, Newark, N. J., has opened new school quarters at 534 Broad Street, making this the third time during the eighteen months of the school's existence that increased enrollment has necessitated expansion. The new school consists of two complete floors with a total floor space of 32,000 square feet in addition to hangar facilities at the Newark Airport.

Special Summer Courses Given

FOUR COURSES are being taught at Vancouver Aero Tech, Vancouver, B. C., this summer with provision made for instruction during the day and at night.

Among the courses is the pilots' technical course including rigging, navigation, meteorology, engines, etc.; a mechanics course and a flight course.

Safair Adds Course to Curriculum

A COURSE in aviation mechanics has been added to the course of study taught at the Safair School of Aviation, Roosevelt Field, Mineola, N. Y. New instructors added to the faculty to teach the new subject include John Klein, Donald Walling and Gilbert Trimmer.

O. P. Hebert, president, has returned to his duties after aiding in getting Pacific Seaboard Airlines started in their air mail carrying operations.

Gerald E. Woods has been added as aircraft sales manager and will operate from the school's New York City office.

School Leases Hangar

SOUTHERN AIR Service conducting a school, operating chartered planes, repairs and storage has leased the hangar facilities of American Airlines at the Memphis, Tenn., Municipal Airport.

William Kent is president, Frank Ward, Jr., secretary and treasurer, and Louis Hulett is in charge at the airport. The company is also sales agent for Stinson and Taylor Cub aircraft.

Howard Gets Honorary Degree

OAKLAND COLLEGE of Engineers, Oakland, California, has awarded the honorary degree of Bachelor of Science to Royal V. Howard in recognition of his contribution to radio development. Howard has been an experimenter and developer of radio and television, and was for several years a research engineer for Western Air Express when radio was first being applied to air transportation. He aided in the building and selection of the radio equipment that Admiral Byrd took on his trip to the Antarctic, and is credited with having done much to solve radio problems. He is now chief engineer for station KTAB, San Francisco.

Twenty-five Students Registered

TWENTY-FIVE students have enrolled in the Marion Flying Service, Marion airport at Marion, Ohio, according to Harold W. Cobb, head of the Flying Service, who said it is one of the largest schools in the state.

Bendix Aviation School Popular

INAUGURATION OF an aviation ground school in South Bend, Ind., for the benefit of employees of the Bendix Products Corporation has met with unusual success and at present more than 50 students have enrolled and are regular attendants, according to O. C. Holaday, executive of the Bendix Products Corporation.

The ground school has for its chief instructor Capt. Charles R. Bowers, and direction of the school is in the hands of M. M. Cunningham, who is also director of the Bendix Automotive Service School. Capt. Bowers is an Army Reserve aviator and has specialized in maintenance work.

The school, in possession of the many products and devices developed by the Bendix Aviation Corp., gives a thorough course in ground instruction and meets three times a week with additional meetings contemplated.

New Ground School Opens

A NEW GROUND school of aeronautics has been established at the Mueller-Harkins Airport, Tacoma, Wash., where H. A. Reed is in charge of ground work and Don Emmons is tutoring in flying. Included in the ground course are air commerce regulations, airplanes, engines and instruments.

CWA Port for School's Base

REGULAR AVIATION classes will be opened on the new Altus, Okla., airport in the autumn as part of the program there of stimulating interest in flying, according to Paul Brown, airport supervisor. The new field, completed with CWA and FERA funds, now is the base for three planes including Brown's Monocoupe.

Reserve Corps Field Dedicated

HENSLEY FIELD, Army Air Corps reserve airport in Dallas, was dedicated recently with hundreds of army men and high ranking officers present. The widow of Col. William Hensley was present and honored at a banquet staged by the Dallas Chamber of Commerce.

Col. Ira Longanecker, 8th Corps Area Commander, officially accepted the field from the city while Mayor Charles E. Turner delivered the dedicatory address. It is estimated that at least 200,000 persons saw the exercises and the maneuvers staged by the army pilots during the two-day ceremony.

Army pilots were tendered a banquet and dance and in turn staged battle maneuvers and a huge air circus which thrilled the thousands of spectators. Squadrons from all fields in the south and southwest were on hand for the dedication.

New Army Base Proposed

ERECTION OF a $3,000,000 air depot in Utah, either in Salt Lake City or in Ogden, is being considered by the U. S. Army Air Corps, according to Secretary of War George H. Dern. The depot, which will serve the western states, Alaska, Hawaiian Islands and the Philippines, would be manned by nearly 600 men with an annual payroll of $1,000,000, staff officers declare. The depots at Rockwell Field and at Alameda, Calif., will not be abandoned nor will any of the California bases be transferred to Utah.

Three buildings will probably comprise the unit, the structures and the equipment estimated to cost between $2,000,000 and $3,000,000.

King Makes First Ranger Landing

REAR ADMIRAL Ernest J. King, Chief of the Bureau of Aeronautics, Navy Department, recently made the first regular landing on the new U. S. S. *Ranger* aircraft carrier operating off Lynnhaven Roads, Virginia. The *Ranger* was commissioned on June 4th and at present is conducting tests and trials at sea preparatory for her shakedown cruise.

Rear Admiral King, accompanied by Lieut. George Moffett, his aide, left the Anacostia Naval Air Station in a scouting plane and upon arrival in Norfolk, changed to a plane equipped for deck landings.

Grumman SF-1, powered by a Wright Cyclone

ARMY BUYS 81 PLANES AND 280 ENGINES

CONTRACTS FOR the purchase of planes and engines have been signed by the War Department as part of its program to build up the Army Air Corps. 81 Martin bombers valued at $3,195,450 and 280 Wright engines worth $1,705,733 were involved in the awards. The allottments are the first contracted for under the Department's new policy of competitive bidding of quantity purchases.

Navy Buys Radio Beacon Receivers

TO INSTRUCT naval aviation personnel in the fundamentals of the operation of the Department of Commerce airways radio beacon system and to enable administration flights to be completed under all weather conditions, the Bureau of Aeronautics plans to procure forty-eight radio beacon receivers for certain ships and stations.

Twenty-three will go to the Naval Air Station at Anacostia; two each to the stations at Norfolk, San Diego and Pensacola; three each to the U.S.S. *Saratoga, Lexington* and *Ranger;* one each to the Commander-in-Chief, Commander of the Battle Force, Commander of the Cruiser Force, Commander of the Aircraft Battle Force and Commander of the Aircraft Base Force; two each to the Marine Corps at Quantico and San Diego and one to the transport plane at Sunnyvale, Calif.

Weddington to Be Transferred

CAPT. HARRY Weddington, commander of Hensley Field, Dallas, will be transferred to Maxwell Field, Montgomery, Ala., on September 1, being succeeded by Capt. Bernard S. Thompson, now stationed at Maxwell Field. Weddington has been in command of Hensley Field for several years and was active in its building and development. He is to take a year's training course in advanced air tactics at Maxwell Field.

Guardsmen in Maneuvers

NINE DOUGLAS planes of the 103rd Observation Squadron, 28th Division Aviation, Pennsylvania National Guard, left the Philadelphia Airport for Middletown, Pa., where they are engaged in annual maneuvers with other P. N. G. units. Major J. V. Dallin is in command of the Philadelphia squadron.

New Army Field Developing

HAMILTON FIELD, new bombing base in Marin County, Calif., is a vitally important unit of the coast defense system in the San Francisco Bay region.

The larger buildings include a hangar, 240 by 120 feet, with an adjoining shop of similar dimensions; an equipment warehouse, 200 by 111 feet, and a three-story building housing barracks and administration headquarters. Supplementing these are a radio station, paint and oil shop, electric substation and gas meter house, sewage and drainage pumping plants.

Officers' homes follow the Mexican type of architecture, and for the non-commissioned officers, there are a number of duplex houses. All residences and work buildings are modern in every respect.

Although the base now represents an investment of $1,500,000, work has really only begun. Complete plans call for an expenditure of $6,000,000 and the construction of four more sets of hangars and shops, several smaller shops, three more barracks, fifty more residences for officers and 20 more duplex houses for non-commissioned officers. Ultimately, the field will house 85 officers, 100 non-commissioned officers and 700 enlisted men, in addition to two bombing squadrons, one headquarters squadron and one service squadron.

The base borders on San Pablo Bay, about six miles north of San Rafael on a 927-acre tract and includes the flying field which is almost a mile square. Its military advantages are that it is on an arm of San Francisco Bay and therefore assured of excellent harbor facilities; it is near San Francisco, headquarters of the Ninth Army Corps Area; it is close enough to the coast-line to permit defensive work far out at sea and it is protected by mountain barriers from attack from the sea.

The project has involved many details, for it has a wide variety of work buildings and homes, eight miles of asphalt pavement, water and sewer systems, nearly three miles of gas mains, complete electric and telephone service and many other constructional features.

Grumman XJF-1 amphibion for the Navy


CHANCE-VOUGHT
CORPORATION
EAST HARTFORD
CONNECTICUT
SUBSIDIARY OF UNITED AIRCRAFT AND TRANSPORT CORPORATION

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

New Airworthiness Requirements

ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics, New York University

AS A result of a number of amended drafts by the Department of Commerce and studies by the Airplane Manufacturers Section of the Aeronautical Chamber of Commerce, the famous Aeronautics Bulletin No. 7-A will appear in a very much revised form. It will now be presumably divided into two parts, one being Airworthiness Requirements for Aircraft, Aeronautics Bulletin No. 7-A, and the other Design Information for Aircraft, Aeronautics Bulletin No. 26. As the new rules become effective August 1, we believe it quite timely to publish these remarks of Dr. Klemin on the effect which the new rules will have on the High Angle of Attack Condition.

• In the old method of High Angle of Attack load factor determination, only two parameters were employed, and straight line graphs of load factors for a given gross weight were plotted against weight/horsepower. The High Angle of Attack load factor was supposed to represent the condition in which a steep dive was followed by a violent pull-up.

Curves of this character can be criticized on the following grounds:

1. They do not take maneuverability into account, except in so far as increase in gross weight tends to decrease maneuverability. Other elements which enter into maneuverability are:

a. The inherent stability of the airplane.

b. The power and mechanical advantage of the elevators.

c. The cleanness of the airplane and hence its speed in the dive and rate of loss of speed in the subsequent recovery.

d. The amount of inertia of the airplane about the lateral axis through the center of gravity.

2. They exaggerate unduly the effect of loading/horsepower. To draw graphs of this character is really to assume that the final speed in a pull-up is dependent on the power loading. In the first stages of a dive the pull of the engine and the slipstream of the propeller acting on the tail surfaces certainly have an effect. Subsequently their effects disappear, and it is only in the later stages of the recovery that power loading again comes into play.

3. The graphs are arbitrarily broken up into three straight lines, and there is no reason for such discontinuity.

4. Atmospheric disturbances are not considered.

The New Condition of Bulletin 7-A

The term High Angle of Attack Load Factor disappears in the new Airworthiness Requirements. It is now replaced by *Accelerated Flying Condition I (Maximum Up-Gust)*. This condition is defined as follows: (Section 15, A and B):

n_{min} = minimum applied acceleration normal to basic wing chord.

W = gross weight in pounds.

p = power loading = W/rated horsepower.

$$n_{min} = 1.0 + \Delta n \left(\frac{15}{p}\right)^{.435}$$

where

$$\Delta n = 0.77 + 32 / \left(\frac{W}{1000} + 9.2\right)$$

C.P. = most forward position between 0.75 $C_{L\,max}$ and $C_{L\,max}$

n_{min} = not less than 2.5 for any airplane.

In addition, a method of allowing for a 30 ft./sec. up-gust at top speed is described in Aeronautical Bulletin No. 26, *Design Information for Aircraft.*

Significance of $n_{min.}$

The significance of the expression

$$n_{min} = 1.0 + \Delta n\,(15/p)^{.435}$$

$$= 1.0 + \left(0.77 + \frac{32}{W/1000 + 9.2}\right)\left(\frac{15}{p}\right)^{.435}$$

is clear from the equation

Design Load Factor = L.F. = 1.5

$$\left[1.0 + \left(0.77 + \frac{32}{W/1000 + 9.2}\right)\left(\frac{15}{p}\right)^{.435}\right]$$

In other words, instead of a Design Load Factor, the Department prefers to make an attempt to calculate the applied acceleration load and then to multiply the normal load + applied acceleration load by a safety factor of 1.5.

While the above article discusses ingeniously the character of the new curves, the facts remain:

1. That while the curves for Design Load Factor are smoothed out (which is a decided step forward), the present Design Load Factors and those obtainable by the new system remain practically the same.

2. Only the same two parameters are taken into consideration, namely, gross weight and power loading.

3. Calculation is just a trifle more difficult.

The first two criticisms of the old High Angle of Attack Condition cannot be said to have disappeared. Perhaps it is impossible to make them disappear.

Maximum Up-Gust Allowance

On the other hand, for the first time in American requirements, consideration is given to gusts as follows:

1. U = maximum up-gust = 30 ft./sec. and reaches its full value in an infinitely short space of time.

2. V = design speed = top speed in level flight in feet/sec.

3. A_w = wing area in sq. ft.

4. s = W/A_w = wing loading in lbs./sq. ft.

5. The angle of incidence is increased, while the resultant speed remains unchanged, by the amount $\Delta\alpha = \frac{U}{V}$ in radians.

6. The change in lift coefficient

$$\Delta C_L = \frac{dC_L}{d\alpha}(\Delta\alpha) = \frac{dC_L}{d\alpha}\frac{U}{V} = m\frac{U}{V}$$

where

$$m = \frac{dC_L}{d\alpha_{radians}}$$

7. If Δn_g = applied acceleration load due to the gust

$$\Delta n_g W = \Delta C_L \rho/2\, V^2 A_w$$

8. So that Δn_g =

$$\Delta C_L\, q \frac{A_w}{W} = \frac{\Delta C_L\, q}{s} = m\frac{U}{V}\cdot\frac{q}{s}$$

Before considering the question of the types of aircraft in which the maximum up-gust is important, it is convenient to put the formula for $\triangle n_g$ in two different forms:

1. $$\triangle n_g = \frac{mU}{V}\cdot\frac{q}{s} = \frac{mU\,\rho/2\,V^2}{V\,s} = \left(\frac{mU\rho}{2}\right)\frac{V}{s}$$

2. $$\triangle n_g = \frac{mU}{V}\,\frac{\rho/2\,V^2}{s} = \frac{mU}{V}\cdot\frac{\rho/2\,V^2}{C_L\,\rho/2\,V^2} = \frac{mU}{V\,C_L}$$

From these formulae, it is clear that the load due to the up-gust will: Increase as the aspect ratio increases (since m or $\frac{dC_L}{d\alpha}$ depends mainly on the aspect ratio); for a given wing loading increase with the speed, in order words, with "cleanness" and low power loading; for a given speed, increase with low wing loading, and for a given speed, increase as C_L of top diminishes.

In other words, the effects of an up-gust will be most severe on a ship of low wing-loading in which high speed has been attained by a combination of high power and aerodynamic efficiency. Effects will not be so severe on a ship in which speed has been mainly obtained by high wing-loading, and which has its top speed at a fair value of C_L. It also follows that if the wing loading is left unchanged, and head resistance decreased and power increased the effect of the up-gust will be felt more strongly.

The formula for gust load in terms of power loading, wing loading and aerodynamic efficiency is obtainable by neglecting the induced drag at high speed (which can be safely done for the modern airplane), and writing:

1. Parasite drag area $= 1.28\ A_e$ where A_e = equivalent flat plate area. (since the drag coefficient of a flat plate $= 1.28$ in absolute units).
2. Minimum drag coefficient $= C_{D_o} = .01$ for the average wing.
3. The total airplane drag at high Speed $V = \rho/2\ [1.28\ A_e + .01\ A_w]\ V^2$
4. "Drag Efficiency Factor,"
$$e = \frac{.01\ A_w}{1.28 + .01\ A_w}$$
5. So that $1.28\ A_e + .01\ A_w = \frac{.01\ A_w}{e}$
6. HP η (where η = propeller efficiency) $= \frac{DV}{550}\,\frac{\rho}{1100}\,[1.28\ A_e + .01\ A_w]\ V^3$

7. $$V = \sqrt[3]{\frac{1100}{\rho}\,\frac{HP\ \eta}{(1.28\ A_e + .01\ A_w)}} = 77.3\sqrt[3]{\frac{HP\ \eta}{1.28\ A_e + .01\ A_w}} = 77.3\sqrt[3]{\frac{HP\ \eta}{.01\ A_w/e}} = 77.3\sqrt[3]{\frac{HP\ \eta\ e}{.01\ A_w}}$$

8. Putting $\eta = .8$
$$V = 332.5\sqrt[3]{\frac{HP\ e}{A_w}} = 332.5\sqrt[3]{\frac{HP}{W}\,\frac{W}{A_w}\,e} = 332.5\sqrt[3]{\frac{s\ e}{p}}$$

9. Then $$\triangle n_g = \frac{m\,U\,\rho V}{2\,S}$$

and putting $n = 4.25$ as a fair average value, $P = .00238$, and $U = 30$

$$\triangle n_g = \frac{4.25\ (30)\ (.00238)}{2}\,\frac{332\sqrt[3]{\frac{s\ e}{p}}}{s} = 50.5\sqrt[3]{\frac{e}{p\ s^2}}$$

10. $$= n_g = .152\,\frac{V}{s}$$

With this formula, granted that the designer knows the value of e from calculation or past experience, it should be possible to get the gust-load very quickly. Of course, if V is known, $\triangle n_g$ will be obtainable still more quickly. We have set up this formula mainly to bring home the relationships existing between the various factors involved.

Calculations for e

In a Department of Commerce Memorandum to Manufacturers, dated December 27, 1932, the 1.28 A_e values were plotted against gross weight, and divided into four classes of various cleanness terms.

Class 1. Cantilever monoplane with retractable chassis, streamlined fuselage, well cowled engine, no external bracing.

Class 2. (a) Cantilever or wire-braced monoplane with cantilever or wire-braced chassis; wheel pants; streamlined fuselage; engine cowl or ring. (b) Biplane or externally braced monoplane with retractable chassis; streamlined fuselage; engine cowl or ring.

Class 3. (Better than average) Biplane or externally braced monoplane; with clean fuselage and chassis; engine cowl or ring.

Class 4. (Poorer than average) Externally braced airplane without anti-drag features.

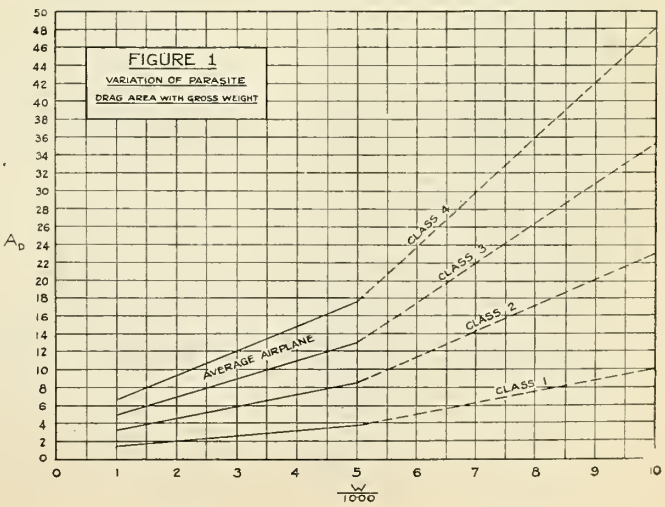
The curves of this memorandum can be replotted with e plotted against the gross weight for each class, on the basis of the formula

$$e = \frac{.01\ A_w}{1.28\ A_e + .01\ A_w}$$

In this case, however, a series of curves in each class (but for different wing loadings) must be prepared.

The sample calculations below illustrate the method:

1. A plane in Class 1:
$W/A = 18$, $W = 8{,}000$ lbs.
$$\text{Wing Area} = \frac{8000}{18} = 434 \text{ sq. ft.}$$
$$1.28\ A_e = A_D = 7.5$$
(Fig. 1, from Department of Commerce Memorandum).
$$e = \frac{.01\ A_w}{1.28\ A_e + .01\ A_w} = \frac{.01 \times 434}{7.5 + .01 \times 434} = .366$$



2. Same ship as above, but in Class 3:

$$A_D = 26.5$$

$$e = \frac{4.34}{26.5 + 4.34} = .1405$$

3. Ship in Class 3:

$$W/A = 15$$

$$A_w = \frac{8\,000}{15} = 533 \text{ sq. ft.}$$

$$e = \frac{.01 \times 533}{26.5 + .01 \times 533} = .169$$

It is evident that the magnitude of e depends on the class and drops as wing loading is increased.

Typical Calculations

On the basis of the above theoretical calculations and empirical curves for the drag efficiency factor e, a number of typical calculations are made in Table No. 1.

Table No. 1
Summary of Results

Class	p	s	Vel. m.p.h.	Usual $\triangle n$	Gust $\triangle n$	Usual L.F.	Gust L.F.
1	5	10	228	4.3	5.1	7.96	9.15
1	10	15	196	3.15	2.9	6.22	5.85
1	10	20	200	3.15	2.23	6.22	4.85
1	15	10	158	2.63	3.52	5.45	6.78
1	15	15	169	2.63	2.51	5.45	5.26
2	12	10	146	2.7	3.25	5.55	6.37
2	12	15	151	2.7	2.25	5.55	4.88
2	15	10	137	2.63	3.06	5.45	6.1

A Curious Result

The formula of the old type with $(15/p).435$ has for p the exponent —.435 and no mention of s the wing loading.

The new gust method gives p the exponent —.333.

Hence as p goes down the effect of it on the load becomes less marked with the gust method than with the old method.

Machines with high values of p and low values of s will tend to be designed by the new gust rule.

Modern machines with low values of p and high values of s will tend to be designed by the old H.A.A. rule.

A study of our typical calculations, confirms these points of view.

We arrive at this curious result. In designing a modern high powered, heavily loaded aircraft the designer need not bother about the gust calculation of Accelerated Flying Condition I. It will not affect the design of the front spar at all.

If an older type of aircraft is involved, particularly one in which the general efficiency is good, then gust conditions have to be carefully taken into account.

The introduction of the up-gust method is apparently a logical step, but the result of the new rule will be curious. Old type ships will have to be reinforced as far as front spars are concerned. These ships do not need strengthening and fortunately they already have an A.T.C. New, very fast ships regarding whose strength there appears to be some slight doubt, will not be concerned with the new rule at all.

An Alternative Interpretation

It should be added however that an alternative interpretation is possible in which $\triangle n_g$ would be multiplied by $\left(\frac{15}{p}\right)^{.435}$

This would be illogical since the calculation for $\triangle n_g$ already takes in every factor including the power loading. The effect of such multiplication would be to make the gust load the predominating factor for powerfully engined machines, and would penalize very fast ships, arbitrarily, beyond the necessity of strength to meet upward gusts. The present article is being submitted for comment to Mr. Richard C. Gazley of the Department of Commerce.

• Recent Aeronautical Patents •

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Airplane. William K. Rose, New York, N. Y. (1,962,411)

Trigger-operating mechanism for aircraft guns. Werner C. L. Haubroe, Copenhagen, Denmark. (1,962,591)

Cooling of internal combustion engines (air cooling of aircraft-engines). Frederick M. Green, Coventry, England, assignor to Armstrong Siddeley Motors, Ltd. (1,962,685)

Gyroscopic compass. Wolfgang Otto and Oskar Richter, Neumuhlen-Kiel, Germany. (1,962,749)

Airplane catapult. William M. Fellers, Lieutenant Commander, U. S. Navy, and Frederick B. Gross, McLean, Va. (1,963,081)

Airplane structural elements. Robert J. Minshall, Seattle, Wash., assignor to Boeing Airplane Co. (1,963,416)

Connecting rod design for radial engines. Fred G. Shoemaker, Ferndale, Mich., assignor to General Motors Research Corp. (1,963,423)

Airplane. Charles A. Blume, Venterville, Ind. (1,963,461)

Flying machine. Walter C. Pitter, Epping, England. (1,963,528)

Screw propeller. Ervin E. Roberts, Hartford, Conn. (1,963,531)

Supercharging organization for internal combustion engines. Edgar H. Crossen, Franklin, Pa., assignor to Franklin Valveless Engine Co. (1,963,613)

Amphibion landing gear for aircraft. Alexander Procofieff Seversky, New York, N. Y., assignor to Seversky Aircraft Corp. (1,963,630)

Flying machine. Russell S. Powell, Tacoma Park, Md. (1,963,676)

Spark plug. Edward B. Nowosielski, Bloomfield, N. J., assignor to Eclipse Aviation Corp. (1,963,714)

Aerial banner. William A. (Tex.) Bohannon, Mineola, and Clara B. Gilbert, New York, N. Y. (1,963,772)

Landing sight for airplanes. Roland Chilton, Ridgewood, N. J. (1,963,826)

Aeronautic instrument. Norman B. Hall, Chevy Chase, Md. (1,963,899)

Speed and drift indicator. Philip V. H. Weems, Lieutenant Commander, U. S. Navy (ret.) and Harold C. Gatty, Washington, D. C. (1,964,012)

Variable pitch and reversible airplane propeller. Ralph Wishon, San Francisco, Calif., assignor to Bendix Research Corp. (1,964,102)

Airplane. William A. Roth, St. Paul, and Henry J. Roth, New London, Minn. (1,964,179)

Control for aircraft and other vehicles. Ernest F. Goodyear, Moxhull Park, Joseph Wright, Stoke Park, and Henry Trevaskis, Keresley, Coventry, England, assignors to Dunlop Rubber Co., Ltd., London, England. (1,964,383)

Airplane. Heraclio Alfaro, Cambridge, Mass. (1,964,418)

Gyro sextant. Scott B. McFarlane and Robert E. Jasperson, U. S. Navy. (1,964,737)

Parachute pack harness. Stanley Switlik, Trenton, N. J. (1,964,864)

Capacity altimeter. Orin E. Marvel, Dayton, Ohio, assignor to Bendix Aviation Corp. (1,965,147)

Aircraft. Joseph M. Gwinn, Jr., Buffalo, N. Y., assignor to Consolidated Aircraft Corp. (1,965,185)

Sheet metal aircraft construction. Earl J. W. Ragsdale, Norristown, Pa., assignor to Edward G. Budd Mfg. Co. (1,965,258)

Design for an airplane. Hall L. Hibbard, Burbank, Calif., assignor to Lockheed Aircraft Corp. (Des. 92,654—Term of patent 14 years.)

Parachute harness. John A. Binnie, Philadelphia, Pa. (1,965,570)

Manipulation and support of aircraft maps. Clinton W. Howard, Dayton, Ohio. (1,965,593)

Method of making propeller blades. Fred E. Weick, Washington, D. C., assignor to Government of the United States. (1,965,622)

Means for measuring distances (for use on aircraft). Wolfgang F. Ewald, Berlin, Germany. (1,965,632)

. Tetrahedral kite. Leo J. Fishel, New York, N. Y. (1,965,634)

Aerodynamic Balancing of Control Surfaces

ARTHUR G. B. METCALF

● In a recent article in AERO DIGEST, the writer presented an expression for the determination of hinge moments for unbalanced control surfaces, based upon wind tunnel tests of large models. These tests, conducted at Massachusetts Institute of Technology have been extended to include a study of two types of balances; the inset hinge and the auxiliary flap. The inset hinge method is in common use and needs no explanation.

The auxiliary flap balance, in general, consists of a narrow flap hinged along the trailing edge of the control surface and connected to the fixed surface ahead of the control surface by a suitable linkage. When this control surface is given an angular displacement, the position of the flap with respect to the movable surface modifies the flow conditions in such a way that the hinge moment is reduced. The method is shown diagrammatically in Fig. 2C for a parallel linkage, this being the assumed motion in the tests.

The comparatively recent use of this device has made it particularly desirable that some definite information be obtained as to the effectiveness of this method of balance, from the standpoint of hinge moment and lift and a determination of the most efficient proportions for the flap.

As a means of comparing the effectiveness of varying amounts of balance for a given angular displacement, the ratio of lift coefficient to hinge moment coefficient $\left(\frac{C_L}{C_H}\right)$ is used as a figure of merit. This is obviously the best means of comparison as it is the lift (lbs.) per pound foot of hinge moment required.

Coefficients and angle conventions are as shown in the accompanying graphs.

The Inset Hinge

Preliminary to the study of the inset hinge type of balance an investigation was carried out to determine the optimum shape for the leading edge of the movable surface. Three leading edge contours were tested, namely, the elliptical, round, and sharp nose. For all conditions of balance and angular displacement of movable surface, the elliptical nose gave substantially lower hinge moments and for this reason all further tests were made using this nose.

Fig. 1A is a plot of C_L and C_H vs. β at $\alpha = 0°$ for three hinge insets, .05 C′, .15 C′, .25 C′, where C′ is the elevator chord through the centroid of the elevator. This plot gives a clear picture of the effect of this method of balance upon the lift and hinge moments. Moving the hinge back reduces the slope $\left(\frac{dC_H}{d\beta}\right)$, spreading the curves fanwise about the origin. The loss in lift is negligible until large elevator angles ($\beta = 30°$) are reached, where the effect of the gap is felt.

Fig. 1B is a plot of balance "effectiveness" $\left(\frac{C_L}{C_H}\right)$ against amount of hinge inset in percent of C′. It is seen that the greatest gain is realized in range between .15 C′ and .25 C′ where the hinge moment approaches zero and $\frac{C_L}{C_H}$ becomes infinitely large. Moving the hinge any further to the rear would cause an undesirable overbalanced condition. At large angular displacements ($\beta = 30°$) the loss in lift is coupled with a rapid increase in hinge moments due to the stalling of the surface and the inset hinge yields practically no gain. This is true in general for all aerodynamic balances when the surface is stalled.

In the aforementioned article, (which appeared in the April, 1934, issue of AERO DIGEST), it was demonstrated, that sufficiently close for engineering pur-

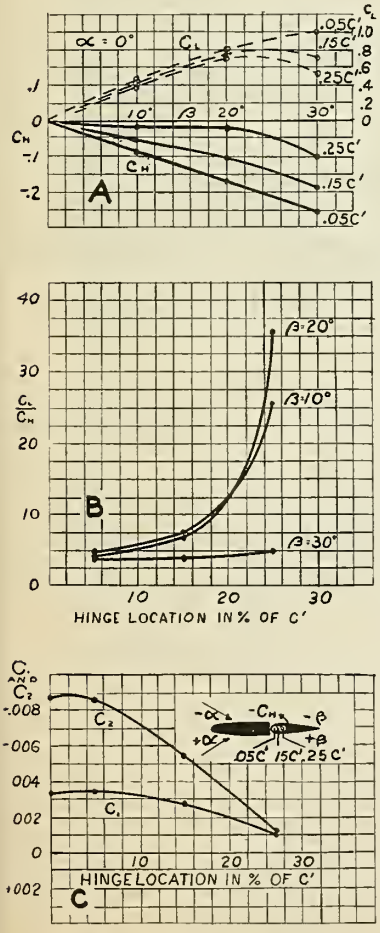


Figure 1. Inset hinge plots

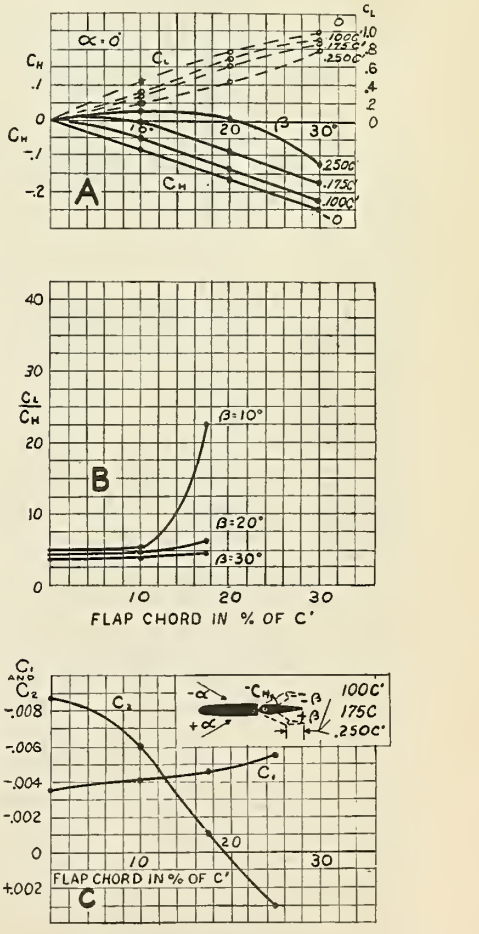


Figure 2. Auxiliary flap

poses, the hinge moment coefficient C_H may be expressed:

$$C_H = C_1 \alpha + C_2 \beta \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $C_1 = \frac{dC_H}{d\alpha}$ and $C_2 = \frac{dC_H}{d\beta}$,

or the slopes of the plot C_H against α and β respectively. The angle of attack of the tail (α) is expressed:

$$\alpha = \alpha_w - \varepsilon + \alpha_o$$

where α_w = angle of attack of wing with respect to wing chord (deg.)

ε = angle of downwash (deg.)

α_o = angle of stabilizer setting with respect to wing chord (deg.)

Fig. 1C is a plot of C_1 and C_2 vs. hinge inset covering the entire range of balance from zero to 25% C'. The designer can pick from this plot values of C_1 and C_2 for any degree of balance and calculate C_H for a given angle of attack of the tail α and a given elevator displacement β. The hinge moment, H, is then determined by the relation

$$H = C_H C' S_e q \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where H = moment about elevator hinge (pound feet)

C_H = non-dimensional coefficient of hinge moment

C' = mean elevator chord (feet)

S_e = elevator area (square feet)

q = dynamic pressure ($\frac{1}{2}\rho V^2$)

Auxiliary Flap

Fig. 2A, 2B, 2C, are corresponding plots for the auxiliary flap type of balance with a parallel linkage and the flap extending the full length of the trailing edge.

Fig. 2A is a plot of C_L and C_H vs. β at $\alpha = 0°$ for four values of the auxiliary flap chord expressed in percent of the mean chord, namely, 0.00 C', 0.100 C', 0.175 C' and 0.250 C'. It is seen that for the parallel linkage with the 0.250 C' flap the elevator is overbalanved throughout the greater part of its angular range, and is therefore undesirable. For the 0.175 C' flap, C_H is greatly reduced, the control becoming slightly unstable at small elevator angles. For this reason it is probably unwise to exceed this value of flap size if a parallel linkage is used.

This method of balance is shown by the curves to be much more effective at small elevator angles than for large angles, since the effect of flap is to shift the plot of C_H vs. β parallel to itself (if we neglect the overbalanced condition), so that the slope $\frac{dC_H}{d\beta}$ remains unchanged except at small values of β where it is greatly reduced and consequently this type of balance is very effective in this range. With this in mind, it appears to be an ideal arrangement to minimize the effort of the pilot of a high speed transport airplane in applying the continual and small control displacements necessary in cross-country flight, without giving him excessive control at large values of control angle and thereby increasing the possibility of overloading the structure.

The auxiliary flap offers, for the same reason, an excellent means of trim for small airplanes, by the use of a simple control whereby the initial setting of the linkage may be varied from the cockpit, and dispensing with stabilizer adjustment.

In Fig. 2B, the plot of balance "effectiveness", it is seen that for flap chords of less than 0.100 C' the value of $\frac{C_L}{C_H}$ is substantially the same as that for zero balance and therefore represents no gain.

For the 0.175 C' flap and elevator angles (β) in the neighborhood of 10°, $\frac{C_L}{C_H}$ becomes very large. As β is increased there is a decided drop in $\frac{C_L}{C_H}$ until at $\beta = 30°$ its value is not much greater than that for zero balance.

The use of the 0.250 C' flap with a suitable linkage arranged to provide smaller angular displacements of the flap (than the parallel linkage) at small elevator angles, and larger flap displacements at large elevator angles, offers the possibility of reducing the hinge moment coefficient to very small values and maintaining large values of $\frac{C_L}{C_H}$ over a large range of elevator angle, without the undesirable overbalanced condition.

Fig. 2C is a plot of C^1 and C^2 for the auxiliary flap type of balance with a parallel linkage. The C_2 plot is for β up to 10°. For values of β greater than 10° the effect of this type of balance is to shift the plot C_H vs. β parallel to itself for all amounts of flap balance (excluding the overbalanced 25% C' flap.) The hinge moment coefficient in this case would be determined in two steps—first by multiplying the value of C_2 (for a particular degree of balance) by 10° and then multiplying the value of C_2 for zero balance by the remaining angle above 10°. then $C_H = C_1\alpha + C_2\beta$ for $\beta < 10°$ and $C_H = C_1\alpha + [10C_2 + \beta' C_{2\,(0)}]$ for $\beta > 10°$ where $\beta' = \beta - 10°$ and $C_{2\,(0)} = C_2$ for zero balance.

Since, for the auxiliary flap, C_1 and C_2 vary somewhat with α and β, (the mean value being plotted) and because of necessity for the above treatment of the expression for C_H, the method becomes more of an approximation than is the case for the inset hinge. Also, only the parallel linkage is considered. However, the curves should prove a useful index for the design of this type of balance because of the lack of data on this subject and enable the designer to more intelligently estimate the linkage when one other than the parallel type is designed.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Airplane Control Surfaces

Aerodynamic Moments of Various Control Surfaces (Moments aérodynamiques de différentes gouvernes), P. Rebuffet. Publications Scientifiques et Techniques du Ministère de l'Air, Service des Recherches de l'Aéronautique, No. 41, 1934, 117 *pp.*, 91 *figs.*

THE TWO experimental studies described were recently completed in the small wind tunnel of the Service. An aileron, formed by a small auxiliary sliding wing, and control surfaces in the form of a V have been investigated and the results compared with those obtained for the usual types of ailerons and tail surfaces. With the auxiliary sliding wing and at the usual angles of incidence, it was found that yawing moments were four to five times smaller than with those produced by the differential deflection of the ailerons for the same rolling moments. The control surfaces in V form, which were tested on the Model B with a total surface 12 per cent lower than that of usual empennages, passed the trimming limits in longitudinal stability by 29 to 36.8 per cent and slightly improved the directional stability. It was also found that the presence of engine nacelles on the model was doubly destablizing because of the interference of the wing and fuselage and also because of the effect of downwash on the tail surfaces. With the V-form control surfaces, this second effect was reduced.

Airplane Dope

Aeroplane Doping Schemes, J. J. A. Gilmore. Aircraft Engineering, Vol. 6, *No.* 64, *June*, 1934, *pp.* 161 *and* 164.

DEVELOPMENT OF dope for airplanes since 1911 is traced and modern methods are described. The author explains why nitro cellulose is used at present. He takes up British performance-test requirements and outlines the methods of testing doped surfaces for tautness, elasticity, brittleness, adhesion, inflammability, rate of burning, increase of weight, and durability.

(*Continued on following page*)

This is a BOEING-40 Instrument Plane, one of the *eight different types* of flying equipment used in Boeing School training.

2 million miles of FLIGHT-TRAINING

BOEING students never fly just to "build up" their time. Every hour of dual or solo flying is closely supervised, as part of a definite, constructive schedule.

In addition to its unexcelled experience derived from the background of 70,000,000 miles of flying recorded by United Air Lines, Boeing School has the practical instruction experience of 2,000,000 miles of student flight-training. One instructor alone has soloed 325 students, many of whom are now employed on leading transport lines in this country, and in foreign countries, as chief pilots, reserve pilots and co-pilots. Another instructor was a pioneer in air mail flying with over 7,000 hours to his credit. *All* Boeing instructors are qualified to fly air mail and passengers as scheduled air-transport pilots.

It is this constant association with aviation as an industry that enables Boeing students to learn flying thoroughly—from the ground up. It will pay you to compare flying schools before you enroll with any. The current Boeing Bulletin gives full details—enrollment requirements, courses, living conditions on the Airport (all-year flying weather), costs, etcetera. Mail the coupon today for your copy.

BOEING SCHOOL OF AERONAUTICS

Division of UNITED AIR LINES INC.

Next regular enrollment, October 2

BOEING SCHOOL OF AERONAUTICS
Room A-8, Airport, Oakland, California

Gentlemen: I am interested in

☐ Master Pilot
☐ Special Master Pilot *(Open to holders of Transport Licenses)*
☐ Airline Operations *(Two years)*
☐ Transport Pilot
☐ Ltd. Com. Pilot
☐ Airline Operations *(Nine months)*
☐ Private Pilot
☐ Amateur Pilot

Name________________ Age______
Years in High School________ Years in College________
Address________________ Phone______
City________________ State______

(*Continued from preceding page*)

Seaplane Take-Off

Motion of Flying Boats during Take-off and Landing Run, T. Ogawa and Y. Murata. Tokio Imperial University, Aeronautical Research Institute—Report No. 105, *Vol.* 8, *No.* 9, *April,* 1934, *pp.* 291-334, 26 *figs. In Japanese with abstract in English.*

TAKE-OFF and landing of the N and Dornier Wal flying boats was measured photographically by a method described in a previous report and the results compared with data obtained in tank experiments. It was found that the water-resistance curve obtained from the take-off of full-scale flying boats was about the same at maximum values as that of the tank. The water-resistance curve for the take-off of the N flying boat had two humps, the first hump speed being smaller than that obtained in the tank and for speeds greater than hump speed, the water resistance was much less than expected from tank experiments. The water-resistance curve for landing differed considerably from that for take-off, while the hump speed was less with the flat-bottom Dornier hull than with the Vee-bottom N hull. Trimming angle was almost constant for the planing stage and the heaving curves showed fair agreement for full-scale and tank experiments.

Fuel Consumption

Comparative Tests with Petrol and Butane on Air and Water-Cooled Aircraft Engines, P. H. Stokes and F. G. Code Holland. (British) Aeronautical Research Committee—Reports and Memoranda No. 1570, *July,* 1933 (*published May* 31, 1934), 66 *pp.*, 28 *figs.*, 12 *tables.*

IN ORDER to ascertain how the performance of a gasoline engine may be affected by imperfect distribution of liquid fuel, comparative tests were made on a Jupiter VIII engine at ground level conditions and on a supercharged Kestrel engine under various altitude conditions, using both gasoline and vaporized butane. The results of the tests appear to prove that losses through inequality of fuel distribution cannot be greater than about 5 per cent and are therefore of secondary importance. However, the great deal of accurate data upon the efficiency-power relationship, which are given for aircraft engines of both the supercharged and normally aspirated types and at altitudes up to 23,000 ft., are probably more complete than any hitherto published.

Engine Progress

The Aviation Engines in 1934 (*Les moteurs d'aviation en* 1934) *M. Martinot-Lagarde. Revue Générale de L'Aéronautique, No.* 17, 1934, *pp.* 85-129, 21 *figs.*, 4 *tables.*

DESIGNS OF the 1934 models of aircraft engines are discussed by the French Inspector-General of Aeronautics. After reviewing the general trend since the Paris Salon de 'Aéronautique in 1930, he takes up in a general way tendencies in the design of American, British, French, German, Italian and Czechoslovakian engines. He then covers the principal characteristics in detail including power, lubricants, fuels, cooling and fuel consumption, and devotes ten pages to superchargers, taking up questions of drive, number of supercharger speeds, comparison of types, position, tests of supercharged engines, and control of the air admitted. He continues a discussion of engines cooled by water and air and describes some mechanical and constructive improvements, as well as engine accessories. He concludes with the specifications of the small engines produced by the various countries for sport airplanes.

Frictional Drag

The Frictional Drag of Flat Plates Below the Critical Reynolds Number, A. Fage. (British) Aeronautical Research Committee—Reports and Memoranda No. 1580, *April* 21, 1933 (*published June* 19, 1934), 7 *pp.*, 3 *figs.*

AT THE low Reynolds Numbers measurements were made on two small plates 0.125 and 1 in. long, respectively, mounted in a small water tunnel, whereas at the high Reynolds Numbers the frictional drag was measured on a 5-in. plate in a 1-ft. open-jet wind tunnel. The drag on each plate was predicted from changes of momentum in the fluid flowing along its surface. The velocity measurements needed for these predictions were obtained for the small plates by a technique involving the use of an ultra-microscope and for the 5-in. plate by small pressure tubes. From the analysis of these and other results, the conclusion was reached that over a wide range the drag is given fairly closely by the Blasius relation, whereas over the lowest range the measured drag is higher than the Blasius value.

Italian Wind Tunnel

Experimental Reports of the Aerodynamic Laboratory of the Superior Royal Institute of Engineering of Turin (Rendiconti sperimentali del laboratorio di aeronautica del R. Istituto superiore di ingegneria di Torino) L'Aerotecnica, Vol. 12, *No.* 4, *April,* 1934, *pp.* 359-434, *78 figs., bibliography.*

CONSTRUCTIVE and aerodynamic characteristics of the open-throat 2-meter (6.56-ft.) wind tunnel of the Institute are described with details of the balance used for model airplanes and propellers. The coefficient of turbulence for the tunnel, which is very high, is calculated according to Dryden and Kuethe. The data obtained with the R. A. F. 15 and 28 and the Goettingen 420 airfoils in other wind tunnels are compared with those secured in this tunnel. Test results on 13 types of wings and airplanes, an automobile and two propellers are illustrated and discussed. Thrust- and torque-coefficient and efficiency curves are given for both propellers while for one propeller the coefficients of drift and moment for a 20° deviation are also derived.

Engine Cowling

Engine Cowling with Special Reference to the Air-Cooled Engine, J. D. North. Royal Aeronautical Society Journal, Vol. 38, *No.* 283, *July,* 1934, *pp.* 566-603, *and (discussion) pp.* 603-612, 29 *figs.*

MAIN PROBLEMS which have influenced the development of the low-drag radial aircraft-engine cowling are discussed. After an historical resume, the author points out the means whereby the cooling resistance may be reduced and compares the N. A. C. A. cowling with the Townend ring. He gives particular details of the Townend ring and takes up the factors on which depend the best angle of ring chord and chord length and explains the practical considerations governing body shapes and the interference phenomenon. He compares model and full-scale results and illustrates Boulton and Paul combined exhaust collectors and Townend rings.

The discussion following the paper includes one contributed by Dr. Watter, who compares the Townend ring with a design of cowling on which he has been working. The author replies to these criticisms and comments on Dr. Watter's article in the January issue of AERO DIGEST.

Convection Currents in Gas

On the Uplift Acting upon a Heated Fibre Vertically Suspended in Gas, Y. Takenonti. Tokio Imperial University, Aeronautical Research Institute—Report No. 106, *Vol.* 8, *No.* 10, *May,* 1934, *pp.* 337-384, 14 *figs.*

WHEN A fine body, such as silk fiber, is illuminated by strong radiation, it is acted upon by an uplift due to the fact that the temperature of the body rises relative to that of the surrounding gas and convection currents are generated near the body by which the body is dragged along. The report investigates the effect of the nature and pressure of the surrounding gas upon the uplift and discusses the relation of the experimental formulas obtained to the differential equations for thermal convection. Uplift was determined by the product of the coefficient of viscosity and the velocity gradient of the gas at the surface of the body. As the velocity gradient of the gas was smaller for the more viscous gas, no remarkable dependency upon the viscosity was expected, and the effect of the temperature gradient in the gas upon the velocity gradient became predominant over the effect of viscosity. Convection currents near the electrically heated wire were investigated by means of smoke.

Bending of Steel Beams

On Yield Points of Mild Steel Beams under Uniform Bending, F. Nakanishi, M. Ito and K. Kitamura. Tokio Imperial University, Aeronautical Research Institute—Report No. 104, *Vol.* 8, *No.* 8, *March*, 1934, *pp.* 274-289, 11 *figs.*

MILD STEEL beams of a cross section asymmetrical about the neutral axes were investigated under uniform bending and the yield points determined. It was found that one side generally yielded before the other, the first yield point corresponding to the bending moment under which one side began to yield and the second yield point to that of the other. Equations are developed for calculating both yield points and the deflections at these points and the calculated results are shown to agree with experimental data.

Engine Cowling

Research on the Cowling of Radial Air-Cooled Engines (Recherches sur le capotage des moteurs en étoile refroidissement par l'air), M. Giqueaux. Publications Scientifiques et Techniques du Ministère de l'Air, Service des Recherches de L'Aéronautique, No. 42, 1934, 50 *pp.*, 34 *figs.*

AFTER REVIEWING the research undertaken on engine cowlings in the United States, England, and in France, the author describes the results of his tests in an Eiffel-type wind tunnel, covering the aerodynamic resistance, the cooling of the engine and the form of the flow of air over various types of radial engine cowlings. The models tested included a series of ring cowlings designed by the Service, four rings furnished by the Morane-Saulnier company, and three cowlings designed by the Yacco company which completely enveloped the engine and regulated the air admitted inside the cowling. The author discusses the influence of the number of cylinders, inside cowling profile, as well as that in the front and rear, longitudinal displacement, interior body of the ring, and incidence, and points out the effects of power and of a body situated at the rear of the engine.

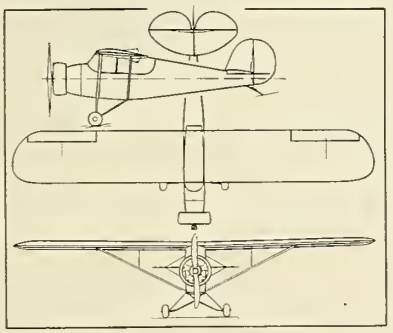
The Porterfield "Flyabout"

● Developed after a year of intensive research, the Flyabout, a two-place high-wing cabin monoplane has been introduced by the Porterfield Aircraft Corp., of Kansas City, Mo. The debut of this new plane also heralds the return to the aeronautical manufacturing industry of E. E. Porterfield, Jr., who a few years ago was prominently identified with one of the leading manufacturers of sport and training aircraft.

The plane, which was designed by Noel R. Hockaday who is in charge of production, has a tandem seating arrangement, and with dual controls is adaptable for flight instruction, cross-country and sport flying, and for passenger carrying. In addition to plenty of space in the cabin to provide pilot and passenger comfort, the plane features wide cabin doors and the latest appointments in interior finishings and instruments. Maximum visibility is provided by the extensive use of fore and side window space.

A sturdy 7.00 × 4 Firestone air-wheeled landing gear with two shock cord rings and a tread of 66 inches, combined with a gliding angle which permits the use of small fields and restricted areas, allows the pilot to make safe landings on many types of terrain.

The fuselage, of chrome-molybdenum steel tubing, is built up according to the Warren truss system which eliminates the necessity for cross-wiring. Covering is with Flightex fabric. Wings have wood ribs and spars, while the tail section is entirely of chrome-molybdenum steel tubing. An adjustable stabilizer, controlled by means of a cable operated from the pilot's cockpit, is provided. Attached to the fin post is a leaf-spring tail skid. Streamlined steel tube struts are used to brace the wings at either side of the body.



Outlines of the Porterfield "Flyabout"

With a wing span of 32 feet, length of 20 feet and an overall height of 6 feet 7 inches, the Flyabout presents a small and compact appearance, enhanced by its blue and vermilion color scheme. It can be powered either with a LeBlond 60 or LeBlond 70 engine, equipped with a wood propeller, and has a top speed of 115 miles an hour. Cruising at 100 miles an hour, a range of 340 miles is possible and as provision is made to carry 15 gallons of fuel, consumption is at the rate of better than 22 miles to the gallon.

Standard equipment includes a Pyrene fire extinguisher, dual controls, first aid kit, 4-ply air wheels and the following instruments: altimeter, oil temperature gauge, oil pressure gauge, tachometer and ignition switch. A Townend ring can be installed at the factory upon request of the purchaser.

Specifications of the Porterfield Flyabout are as follows:

Wing span	32 feet
Overall length	20 feet
Overall height	6 feet 7 inches
Wing area	147 square feet
Chord	54.5 inches
Weight, empty	702 pounds
Gross weight	1180 pounds
Fuel capacity	15 gallons
Oil capacity	2.5 gallons

Performances

Maximum speed	115 miles an hour
Cruising speed	100 miles an hour
Landing speed	40 miles an hour
Climb	800 feet per minute
Take off	200 feet
Cruising radius	340 miles

Two-place LeBlond-powered sport plane produced by the Porterfield Aircraft Corp.

Five-place Amphibion designed by Capt. Frank Courtney for Curtiss-Wright

● A new five-place biplane amphibion, combining high performance and large load carrying capacity with many novel constructional features, has been designed by Capt. Frank Courtney for the Curtiss-Wright Corporation. This design will be discussed more fully in a special article by Capt. Courtney in the next issue of AERO DIGEST.

Anodized and painted Alclad is used throughout in the construction of the hull, while tail surfaces are of dural protected from corrosion. Wings have beams and ribs of spruce and duralumin is used for the ailerons. The vertical fin, built integral with the hull, is also of Alclad.

A pilot and four passengers can be accommodated in the cabin, arranged either with the pilot in front alone and four seats behind, or with dual control side-by-side seats in front and three passengers behind. With the former arrangement the two front passenger seats can be reversed and a table placed between the passengers.

A luggage compartment with a capacity of 18 cu. ft. is located forward with a hatch accessible from the forward deck and another compartment, this one of 21 cu. ft., aft, accessible either from the deck or passenger cabin. Entrance to the cabin is through a hatch in front and owing to the position of the engine and propeller, passengers are free from oil and the slipstream.

Biplane wings, with a large stagger, permit the lower wing to be placed behind the passenger cabin, enhancing passenger visibility. The biplane arrangement also allows use of 40-foot wing span (upper wing), thus enabling the plane to be accommodated either in a private hangar or aboard a yacht. All external bracing is by means of rigid struts. Ailerons are on the lower wing only.

The main landing wheels are behind the center of gravity, so that on landing, the machine lands normally, but gradually falls forward on to a third wheel in the nose. The behavior of the ship on landing is thus the same on land as on water. This arrangement enables the main wheels to be withdrawn completely into the hull without interfering with passenger accommodation, and also avoids ground-looping. By placing the main wheels behind the center of gravity, not only is a ground-looping tendency reversed, but it is possible to apply the brakes fully at any time without any risk. The nose wheel support retracts into a mast at the bow of the hull. This mast is useful as a handhold when docking, mooring, etc. In its retracted position, the nose wheel also acts as an adjustable bumper.

A Wright Whirlwind engine of 365 h.p. (maximum output) and operated on 73 octane gasoline is used. At 2100 r.p.m., 350 h.p. is available. The propeller, carried aft on a short extension shaft, is 31 inches from the engine shaft and is clear of the front of the cabin. The use of the extension shaft enables a streamline cowling to fit around the engine unit, leading to low drag and high propeller efficiency.

The nose of this cowl is in itself the oil tank, an arrangement which provides efficient oil cooling.

The amphibion has an overall length of 31 ft., is 11 ft. 8 in. high (from the hull bottom and with the wheels down) on land and has an overall height of 12 ft. 2 inches. The gross weight is 4650 lbs., and 120 lbs., can be used either for additional equipment, extra fuel, radio or special instruments. With the landing gear removed, the ship as a flying boat can accommodate another 400 lbs. for payload or fuel.

Maneuverability and control on the water is enhanced by a double water rudder connected by springs to the main rudder control. In the air, longitudinal trim is provided by tabs on the elevators, controllable from the pilot's seat.

Specifications

Wing span, upper	40 feet
Wing span, lower	35 feet
Length overall	31 feet
Height overall	12 feet
Horsepower, Wright Whirlwind	365

Areas (Square Feet)

Upper wing	179.2
Lower wing, including ailerons	149.8
Ailerons	25.36
Stabilizer	30.82
Elevator	16.84
Rudder	11.60
Fin	27.75

Weights (Pounds)

Pilot	170
Four passengers	680
Baggage	120
Gasoline (80 gallons)	480
Oil (6.75 gallons)	50
Marine gear, etc.	50
Weight, empty	2980
Total weight	4530

Performances

Top speed	151 miles per hour
Cruising speed	125 miles per hour
Cruising range	550 miles
Rate of climb (sea level)	835 feet per min.
Service ceiling	14,000 feet
Absolute ceiling	16,200 feet

Side view of the Curtiss-Wright Amphibion at rest on the water

***While* VELLUMOID *is a fibre packing, not all fibre packings are by any means* VELLUMOID.**

VELLUMOID is so well known by the trade that they have come to consider the name VELLUMOID to mean any fibre packing.

This is not so, for VELLUMOID is a distinct product and, like all products which are good and constantly used, there are now many fibre packings on the market which are sold as "just as good as" or "the same as" VELLUMOID.

You know what VELLUMOID is without our telling you, and if you desire this product instead of a substitute, won't you insist that you receive what you want?

The word VELLUMOID is branded on every foot of Vellumoid Sheet Packing and we make no sheet packing under any other name.

The Vellumoid Co., Worcester, Mass.

MEMO *from* FLEETWINGS INCORPORATED

TO CHIEF ENGINEERS:

THE "SHOTWELD" SYSTEM OF
STAINLESS STEEL CONSTRUCTION
has these advantages--

(1) Timing, pressure and current scientifically accurate for every job. Machine controlled!

(2) The patented "Shotweld" process does not weaken the surrounding metal or weld.

(3) The "Shotweld" itself and the Stainless Steel are proof against corrosion (even in salt water).

Write for information re: ribs, wing beams and control surfaces.--

CONTRACTORS TO THE ARMY AND NAVY

FLEETWINGS INC. ROOSEVELT FIELD • • • GARDEN CITY • NEW YORK

» » » » have purchased

BEECHCRAFTS

THEY READ

• • • the advertising of The Beech Aircraft Company, even as you are are reading it now.

THEY CAME

• • • to see the Beechcraft, and to fly in it.

THEY COMPARED

• • • its performance and pay load with planes of twice its horsepower.

THEY PURCHASED

• • • when they were satisfied the claims made by The Beech Aircraft Company were based on actual performance.

•

THE 225 h.p. Beechcraft is a four or five place cabin biplane, with retractable landing gear. It cruises at 152 m.p.h. and has a landing speed of 45 m.p.h.

New descriptive literature on all three Beechcrafts (Model A17F, 690 h.p.; Model 17R, 420 h.p.; Model B17L, 225 h.p.) is just off the press. Which model are you interested in?

The BEECH AIRCRAFT COMPANY
WICHITA, KANSAS

Fuel Injection Pump For Diesel Engines

• A STANDARD fuel injection pump for high-speed Diesel engines has been announced by the Ex-Cell-O Aircraft and Tool Corp., Detroit, Mich., through C. R. Alden, research engineer, in a paper given at the American Society of Mechanical Engineers' Annual Convention of the Oil and Gas Power Section, State College, Pennsylvania.

Most engines manufactured heretofore in the United States have used foreign built fuel injection pumps.

The fuel injection pump system is sturdy, simple, compact and light in weight, and is one of the few, if not the only, successful types made in the U. S.

The pump consists of the drive unit and the hydraulic unit, the former mounted directly on the engine, thus making it practically a part of the engine structure. This enables the engine builder to eliminate several parts and operations and will not permit misalignment which causes rapid wear.

The hydraulic unit is removable and is furnished as a sealed assembly. This requires a minimum amount of time for servicing, all of the precision or hydraulic parts of the pump being replaced as a unit.

Incorporated as an integral part and located on top of the fuel injection pump is a secondary filtering unit. The fuel oil must pass through this filter before entering the hydraulic unit. A two-step filter is employed, the first being a specially woven wood fabric and the next a spirally wound edge filter. A fuel transfer pump is available for delivering oil to the injection pump if there is not sufficient gravity head.

Portable servicing platform used by Eastern Air Lines at its servicing base

Portable Service Platform

• EASTERN AIR Lines has developed a new stand which permits mechanics and inspectors to reach parts of the transport planes which heretofore were accessible only with difficulty.

This portable platform makes it convenient to overhaul or inspect the wing, nacelle structure and engines, independent of any overhead support. It is thus possible to work on the planes out-of-doors as easily as in hangars.

The construction, and the method of using the servicing platform is as follows: The main supporting member is a large steel tube with the necessary base members and steel ladders welded to it. The platform may be raised or lowered to any desired height by a hand crank operated from the ground and may be clamped in any position. The railings may be unshipped from their sockets when full clearance is desired and two men may conveniently work on the platform without danger of tipping over. The entire structure is rugged and its large casters permit easy transportation about the shop. Many uses have been found for this device and it has eliminated unsightly and awkward ladders and scaffoldings formerly required for servicing and cleaning the large transports.

Nuway Gas-Oil Adapter

• A METHOD whereby a gasoline burning internal combustion engine can be converted into a fuel oil burner has been developed by Nuway Engineering Corp., Detroit. By using a new fuel oil adapter, the distillate is brought to a low combustion point where it is said to operate at higher efficiency than gasoline and eliminate the problem of the weight and size of Diesel and semi-Diesel engines. The adapter can be used on any gasoline engine and adds only five to seven pounds to the weight of the engine.

In recent tests made by Prof. F. J. Linsenmeyer, Director of Mechanical Engineering, University of Detroit, without any carburetor adjustments or other mechanical changes, a decrease of 24.2 per cent in fuel consumption was shown when running full throttle on oil, together with an increase in r.p.m. The engine developed 87 h.p. maximum at 1700 r.p.m. and used 500 c.c. of oil in 56 seconds as against 81 h.p. at 1650 r.p.m. while using 500 c.c. of high test gasoline in 46.8 seconds at full throttle.

Determining stabilizer flutter characteristics of the Lockheed Electra

Vibration Tester

• POSSIBILITY OF destructive flutter developing in the control surfaces of modern high-speed airplanes, is substantially eliminated by the use of a machine that determines the natural frequencies of vibration of all major parts of the airplane. The machine makes it possible to eliminate the hazard of destructive flutter which may occur at high speeds when control surfaces have the same natural periods of vibration as the structure which supports them.

If two parts are found to have the same or similar rate of vibration, at least one of the parts is redesigned to separate the frequencies. Heretofore a flight test was required to determine the vibration periods, but with this new device the necessary testing can be done accurately in the factory before the airplane leaves the ground.

The illustration shows the device being used to determine the flutter characteristics of the horizontal stabilizer of the Lockheed *Electra* airliner. A shaft, connected eccentrically to a small flywheel run by an electric motor, transmits the impulses through springs to the stabilizer, which responds when its natural frequency is reached. All parts of the Electra were tested in this manner.

Westport Dynamotor For Aircraft Radios

• A LIGHT-WEIGHT and compact dynamotor which eliminates B and C batteries has been introduced by Westport Manufacturing Co., Glendale, Calif., for use in conjunction with aircraft radio receivers.

The unit consists of a motor generator which draws 12- or 6-volt current from an aircraft A battery and delivers proper

B and C voltages. To operate from 12- or 6-volt A batteries, models are available for delivering 180 and 90 volts at 60 milliamperes; 180, 90 and minus 12 volts at 40 milliamperes, and 250 and 125 volts at 50 milliamperes. The ratio of power output to input is high.

Complete with filter, the dynamotor weighs less than seven pounds, and its cadmium plated steel case and mounting base measure 7 by 6 by 3 inches overall. It may be mounted in any convenient place in the plane, and requires only one cable, the conventional B-battery lead.

A dynamotor, recommended for use when the A battery is equipped with a battery charging generator delivers constant plate voltage to the receiver, while B batteries experience a constant drop in voltage during use.

Flexible Seamless All-Metal Hose

• THE FLEXIBLE seamless all-metal hose produced by the Seamlex Corp., Long Island City, N. Y., for conveying steam, gases, liquids, powdered materials and for vacuum and high pressure uses, is the culmination of years of effort which has given a product unique in mechanical and engineering design.

The product boasts exceptional flexibility and strength as a result of its deep convolutions; it avoids detrimental internal stresses when tightening the end connections and has adequate wall thickness in correct proportion to the diameter of the tube to effectively resist maximum stress and corrosion.

Left hand helical corrugations terminating in straight uncorrugated ends for flaring, eliminate soldering, brazing, and welding. The plain end connections, made in one piece, and suitable for solderless, brazeless and packless fittings, are ideal for high-temperature service.

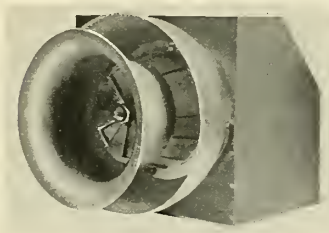
Produced in bronze, steel, aluminum, monel, silver and other metals, Seamlex comes in sizes ranging from 1-16 inch to 2 inch I.D. By study, investigation, and test, the company has developed a unique raw material which is continuously being subjected to tests of chemical composition, crystallic structure, internal stress, ductility, temper, tensile strength and elongation as well as corrosive resistance, and interior and exterior physical condition.

Binks Spray Gun Unit

• A NEW production spray gun, known as the H. D. B. No. 5, which is claimed to reduce material costs and provide other advantages, has been introduced by the H. D. B. Corp., Chicago, Ill.

During the past five years finishing methods have changed considerably due largely to the fact that solid content of materials has been increased, making them more difficult to break up and apply with the ordinary spray gun. Also, new finishing materials have been developed which have been found difficult to apply with the ordinary type of equipment in many cases, and production speeds have been increased demanding faster finishing equipment to keep pace with other developments.

This new gun is said to be unique in body design. Perfectly balanced, having all moving parts constructed in one line to eliminate off-side pulls, it will operate consistently over a much longer period than is customary without replacement of any of the parts. It features a new-type nozzle head and operates on a new principle, producing a highly atomized break-up of material, with actual forward speed of the spray reduced to such an extent that a very noticeable portion of the usual spray mist is eliminated. Another advantage claimed is that material which has already been applied and which is still wet is not rippled as formerly, eliminating the objectionable orange peel effect.



Bullard horizontal siren

Directional Coding Siren

• THESE SIRENS, produced by E. D. Bullard, San Francisco, Calif., are built in sizes from 1 to 15 horsepower, both in vertical and horizontal types. The illustration shows a 1 horsepower, horizontal siren, and pictures the directional parabolic deflector and projector which control the direction of the sound signal. After continued tests, this design has proved effective in regulating directional sound control.

Sirens may be equipped with a coding mechanism, operated by a shutter which opens and closes the ports and intake area on the stator, through which the sound travels. When the shutter is open, the sound comes out in full volume. When closed, approximately 95 per cent of the sound is restrained. The shutter is operated either manually or automatically by a solenoid and its action is immediate, effecting a quick and sharp code signal.

Literature describing these sirens and also fractional horsepower sirens may be obtained from the manufacturer.

MEET ELLIOTT ROOSEVELT

(*Continued from page 24*)

say that it doesn't take any courage to face your own father and tell him that he has made a bad move; but this young man's father happens, by the grace of God and Jim Farley, to be President of the United States, and that makes it rather different. The air mail mess was the one really bad political move that the President has made, for it has shown the people how rapidly we are drifting into a form of government that is throwing aside legal processes and is resorting to bureaucratic bludgeoning and an iron-clad control exercised by one numerically insignificant group of men. There is no essential difference between the policy that can deprive men of their financial contracts without legal processes in open court, and the policy of Hitler, that can deprive political enemies of their lives without a fair and open trial.

Leaving the Hearst papers with their legs and lingerie, Elliott Roosevelt contracted his present connection with the Aeronautical Chamber of Commerce, as Vice-President. Of course, I'm not saying that if his name had been Smith he would have been hired. But he'll stand on his own feet, and if he got the job because his name was Roosevelt, he'll hold it or he'll give it up if he doesn't like it because he is what he is—a very independent sort of chap who will go his own way once he is determined that his way is the right way. I'm for him, myself, and I wish him all success in his new work.

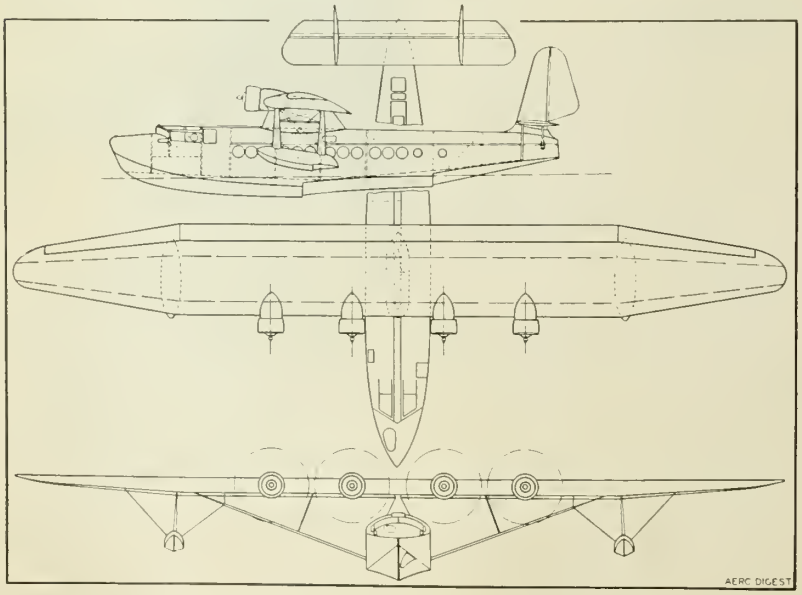
Basic Design Features of the Sikorsky S-42

H. A. FRANCHIMONT

Aircraft Engineer, Pan American Airways, Inc.

● Nearly four years ago it was apparent to Pan American Airways System that the maintenance of America's leading position on international air routes demanded a greatly advanced type of transport aircraft. The consideration of that problem established requirements for a high performance, highly efficient marine transport aircraft capable of maintaining scheduled transport service, with adequate mail loads, over a non-stop range of 2,500 miles with an air speed of 145 miles per hour against a thirty mile headwind. Exhaustive research was to be done on methods and materials through the use of which such high performance characteristics could be secured. When this study established the feasibility of constructing such an airplane the outlined specifications were given out to a group of airplane manufacturers together with an opportunity of attacking the problem in detail with Pan American engineers in an effort to design an efficient trans-Atlantic airplane which, at the same time, would be ideally adaptable to the requirements of inter-American air transport service.

H. A. FRANCHIMONT has spent over 26 years in aviation, his first aeronautical work being in 1908 in France. In 1910 he went to Holland where he constructed and flew his first airplane. In 1912 he went to the Dutch East Indies, returning to France in 1915 where he remained during the war. During this period he was associated with Renault, famous builder of aircraft engines, who was engaged in the production of airplanes for the French Government. He came to America in 1918 and was associated with Curtiss, Sperry, Chance Vought, Atlantic Aircraft, Fairchild and other well-known aeronautical companies. In 1930 he went with Pan American Airways where he has devoted his time to engineering and design problems associated with the present and future types of aircraft being produced for use on the Pan American Airways System.



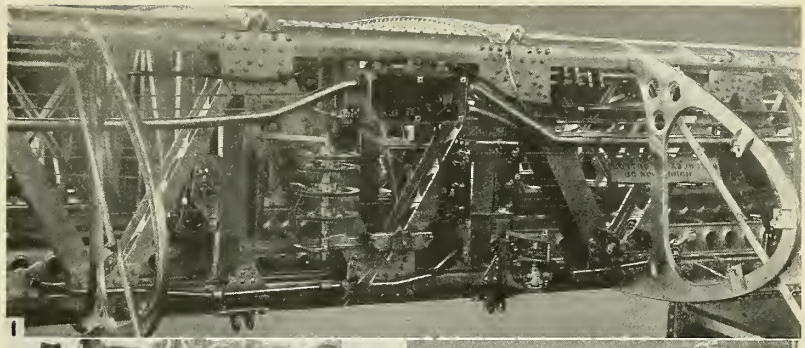
Outline drawings of the Pan American Airways' Sikorsky S-42

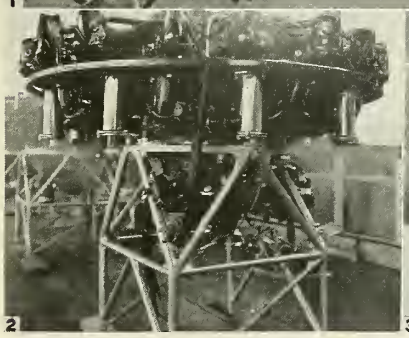
During the two years that the design was under construction and development, the need for carrying passengers as well as mail, resulted in additional stress being placed upon the aircraft's ability to fulfill this new requirement, adding, as it did, new complications to the basic problem of design.

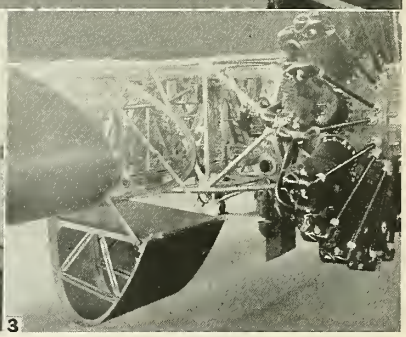
At this time the general trend of the aeronautical industry seemed concerned mainly with high speeds, vaguely surrounded by other important attributes, such as economy of operation and efficient performance. The economy and efficiency of any form of transportation is directly related to such equally vital requirements as low maintenance costs. The necessity for the utmost safety is taken for granted, as no vehicle is worth consideration if it does not include this factor as a prime requisite. Turning back to 1913 and 1914 we had the foundation of research made by scientists and far-sighted engineers, such as Durand in

France, who at that time made exhaustive studies of the long range airplane problem with particular reference to trans-Atlantic flight. So when manufacturers consulted with Pan American, guidance and suggestions were given them in this spirit and it became thoroughly understood that Pan American was not interested in planes predicated on the old axiom of "speed at any price."

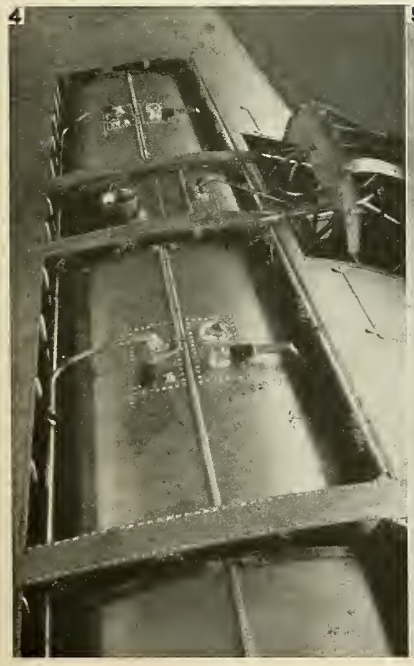
The solution of economical transport by airplane, as indicated by Durand and proved to a degree by our altitude-controlled flight operations over the Caribbean, is that flight should be made at high altitudes. This makes it possible to get the longest range in relation to a given amount of fuel consumed, and at much higher speed than can be reached at sea level. This saving of fuel makes it possible to carry correspondingly heavier payloads. It is evident that the airplane must fly at its maximum L/D ratio. In order to combine this with high speed it is necessary that the plane fly at high altitude. The required speed at any fixed angle of attack which corresponds with the maximum L/D is proportional to the square root of ratio of the density at sea level compared with the density at altitude. Economical flying, which is at maximum L/D, has also been revealed by the range equations of Louis Breguet in France and Lieut. Walter S. Diehl, U.S.N. Therefore, it was decided to power the plane with four supercharged air-cooled engines, each developing 650 h.p. at 2,150 r.p.m. at an altitude of 5,000 feet. Of course, as long ago shown by Durand, the utilization of controllable-pitch propellers was most necessary for deriving the maximum efficiency for take-off and climb with low pitch, and cruising and high speed flight with the pitch set at a high angle.

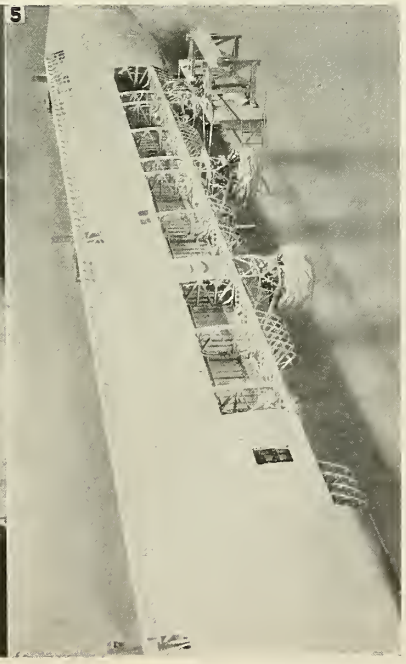






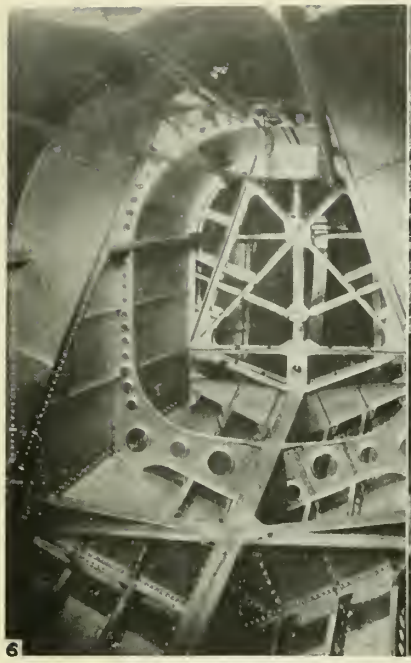
(1) Middle of front wing beam of the Sikorsky S-42, showing engine control cables, ball-bearing pulleys, and electrical system junction. (2) Complete engine mount unit on the assembly floor. (3) One of the folding steps in the leading edge of the wing, for engine mechanics. (4) Fuel and oil tanks set in the wing behind each engine. (5) Metal wing structure, showing trailing edge flap before covering with fabric

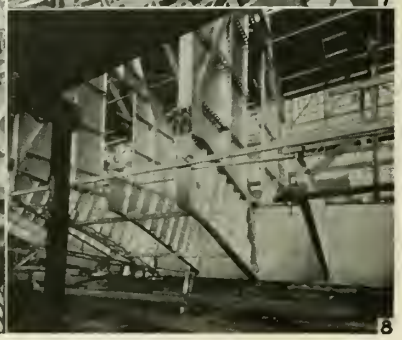




An airplane required to carry heavy pay loads efficiently must have a wing with a relatively high aspect ratio, especially when the requirements are for quick, short, take-offs, fast climbs, high ceilings and slow landings. Therefore, although the wing area of the new S-42 is less than its predecessor (about 1,330 square feet as against the S-40's approximately 1,740 square feet) the aspect ratio has been increased to 9.8 as against about 7.5 for practically the same span of 114′ 2″ against the S-40's 114′.

In the new ship the wing loading is greatly increased over the previous Clipper ship, as it was known that high wing loadings were not only more efficient for this type of ship but fortunately the flying characteristics were also more conducive to passenger comfort. Whereas the previous model had a wing loading of about 19.5 pounds per square foot (for a gross weight of 34,000 pounds), the S-42 carries a load equal to 28.5 pounds per square foot, for a gross weight of 38,000 pounds. These heavy gross weights were perfectly advisable for flying but not desirable for landing a plane within the required landing speeds dictated by the Department of Commerce. Pan American engineers many times previously suggested the use of some kind of speed range device (usually referred to as high lift devices) and it was ultimately decided to incorporate such a device so that the splendid flying





(6) Interior of the hull of the Sikorsky S-42, looking aft and showing stabilizer adjustment post. (7) Looking down on the framework of pilots' cabin floor. (8) Details of the hull frame and keel structure, amidships. (9) Bow of the hull in jig during early stages of construction. (10) Stern of hull, showing bottom stringers. (11) Exterior view of hull as it neared completion at the Sikorsky plant at Bridgeport, Conn.

characteristics obtainable with the plane with heavy wing loadings would not be spoiled in any way.

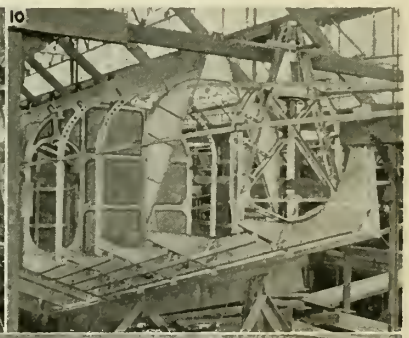
Originally the use of flaps was not contemplated for the design, but further consideration was given to their desirability as mentioned above. After investigating the characteristics and possibilities of many types of flaps, beginning with those with which the writer was familiar in 1916 and including those devoleped by Breguet and other pioneer manufacturers as well as the modern versions of these devices, a type of flap was decided upon which demonstrated beyond doubt the claims originally made for it.

This flap, which extends along the entire untapered portion of the wing, is of the simple trailing edge aileron type rather than the split or auxiliary type. It has the advantage of the utmost simplicity both in construction as well as in operation. It has a downward or positive movement of 40° and an upward negative movement of 3°. Hydraulically operated, it can be lowered or raised in about 15 seconds. The negative angle of this flap has an effect equivalent to reducing the lift coefficient and inducing higher speeds in horizontal flight. At stalling speed the positive flap angle increases the lift, thus widening the speed range from 65 miles an hour to 190 miles per hour, and carrying a gross load of 35,126 pounds. Calculations showed that, carrying a gross weight of 33,508 pounds, the stalling speed would be about 68.5 miles an hour without the flap. With the flap, in some tests, speeds below 65 m.p.h. have been obtained with a gross load of 38,000 pounds. Thus the use of the flap permits a slower landing speed while carrying some 4,500 pounds greater load.

Take-off time is also considerably reduced with the flap 10° down, only an average of 20 seconds being required to take off with a gross weight of 36,000 pounds. Edwin Musick, Chief Pilot of Pan American Airways, and Col. Lindbergh made a series of flight tests and landings to check up the flight characteristics of the S-42. As an evidence of the thorough manner in which the ship was tested—one day 18 test flights were made, the next day 30 and another day 26 flights. Nine test flights were made with a gross weight of 38,000 pounds. These flights demonstrated the ship's easy handling in the required maneuvers in the air and on the surface of the water.

In deciding upon the location of the engines and propellers, in regard to efficiency and cooling, it was realized that if these units were placed above the wing, as originally planned by the manufacturers, a corrective down load on the tail would be necessary to keep the ship in horizontal flight, which is of course contrary to the interests of efficiency. Yet it was important to keep the engines well above the water line. However, the size of the plane and the development of suitable cowling for the engines made it possible to locate the engines in line with the leading edge of the wing, as indicated by tests made by the N.A.C.A. This placement brings the thrust line in an advantageous position in regard to smooth flow of air over the wings and in respect to the air loads on the tail.

(*To be continued in the September issue*)



ON PAN AMERICAN'S SIKORSKY S-42 PAA

HAZARD "KORŌDLESS" CABLES

on the flying and engine controls of the NEW SIKORSKY S-42

The Sikorsky S-42 is the first of six new giant airliners designed and built for Pan American Airways to maintain America's supremacy in overseas mail and passenger service. . . . Every detail of design and construction of the Sikorsky S-42 represents the most advanced practice known. Therefore, Hazard Korodless Stainless Steel Aircraft Cable was specified to provide positive, smoothly operating, dependable engine and other controls, despite continuous exposure to sea air and salt spray. Because Hazard Korodless Aircraft Cable is entirely immune to the corrosive action of salt air and water, it gives greater safety and lowered maintenance costs. . . . This advanced type of aircraft cable is manufactured to rigid U. S. Army and Navy specifications and approved by the Bureau of Air Commerce of the Department of Commerce. . . . We will be glad to place our Engineering Department at the service of aircraft designers and manufacturers, or to furnish booklets and techical data covering all uses of Hazard Korodless Cable for aircraft, marine and general industrial purposes. Write us.

HAZARD WIRE ROPE COMPANY

AVIATION DEPARTMENT • 230 PARK AVENUE • NEW YORK CITY

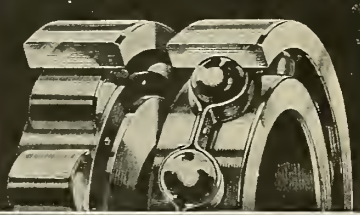
The
BRAZILIAN CLIPPER
is equipped with the
SPERRY PILOT
for Automatic Flying

★

and two
SPERRY
DIRECTIONAL GYROS

SPERRY

TWIN



PRECISION

"NORMA-HOFFMANN"
BALL & ROLLER BEARINGS
for any
LOAD - SPEED *or* DUTY

ASK FOR CATALOG AND ENGINEERING COUNSEL

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.

Aircraft Development Corporation Model V-1A Vultee Transport

● Model V-1A Transport, a 10-place all-metal monoplane with retractable landing gear and tail wheel and split trailing edge type wing flaps, has recently been tested by the Aircraft Development Corp., Glendale, Calif., manufacturers. It is a high-speed transport designed to carry both passengers and mail, and being intended primarily for use on scheduled airlines, is equipped with full night flying instruments, two airways 3-minute flares and complete Western Electric two-way radio installation.

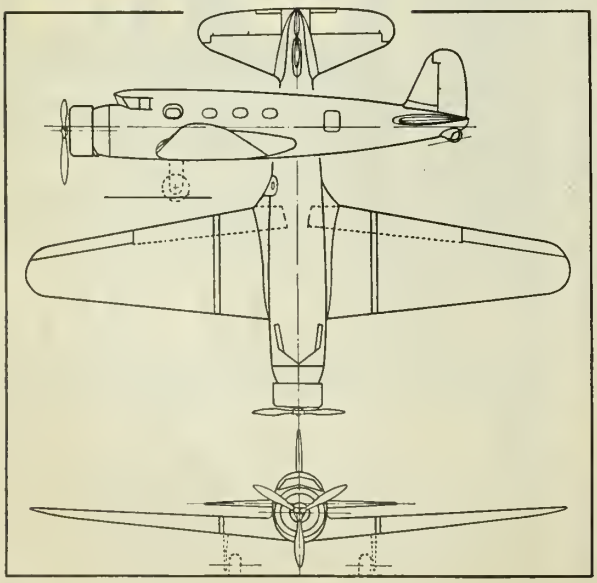
Power is supplied by the new Breeze-shielded Wright Cyclone F-2 engine delivering 735 h.p. at 1950 r.p.m. and equipped with a 10-foot diameter three-bladed Hamilton Standard controllable-pitch metal propeller, Eclipse starter and Romec fuel pump. Gasoline tankage is provided for a range of 1000 miles.

Eight passengers, accommodated in a 250 cubic foot cabin, are seated two abreast in seats adjustable to six positions and separated with a 12-inch aisle. The fuselage measures 68 high by 58 inches wide, providing ample room for comfortable seating and a 40 cubic foot mail compartment assures space for a large load of mail. Behind the last seat is the main cabin door, and immediately opposite the door is a lavatory (equipped by the Dayton Manufacturing Co.), aft of which is a 50 cubic foot baggage compartment and the main radio installation. Cabin upholstery has been supplied by the Laidlaw Co., and Haskelite plywood has been used for floors with a thick Balsa wood core and thin faces of spruce.

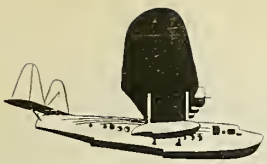
Faired into the fuselage so that its lower surface is tangential to the bottom of it, is the cantilever wing. A center section integral with the fuselage, and two outer sections attached to the center section by means of bolts, make up the wing assembly. The former contains the retractable landing gear and the gasoline tanks. The outer section comprises two parts, one a detachable nose section carrying the leading edge type landing lights and removable in four sections, and the rear part carrying the principal structure of the outer wing to which the ailerons and flap gear are attached. This portion of the wing is of the "shell" type construction, the main strength member being a corrugated upper and lower covering to which a smooth outer covering of Alclad sheet is attached. The entire wing is rendered accessible for inspection by the removal of the nose sections as the front shear beam of the rear section is of the open truss type, a type of wing construction particularly suited to lower maintenance costs, as the leading edge of the wing usually sustains most of the damage from hail or ground accidents.

A 12-foot 1-inch wheel tread is provided, with the wheels, equipped with Goodyear tires, completely enclosed and flush when retracted, folding inwards into the leading edge of the wing. Operation of the retracting mechanism is by a rotary motion of the cantilever leg of the gear about a pivot tube, by means of a worm drive. An electric motor drive, operated by throwing a toggle switch, lowers the landing gear in about 17 seconds. No attention is necessary on the pilot's part other than throwing the switch. An emergency manual control is also provided, and warning devices, as well as a pointer in the cockpit, indicate the position of the

(Continued on following page)



Outlines of the Vultee V-1A and details of its retractable landing gear mechanism



PAN AMERICAN'S
NEW SIKORSKY S-42

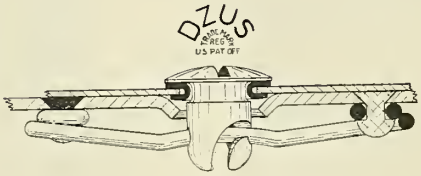
MANUFACTURERS WHO SPECIFY DZUS FASTENERS FOR THEIR PLANES

•

Airplane Development
Amphibions, Inc.
Beech
Bellanca
Boeing
Brewster
Consolidated
Cunningham-Hall
Curtiss
Curtiss-Wright
Douglas
Edo Aircraft
General Aviation
Great Lakes
Grumman
Kellett
Kreider-Reisner
Lockheed
Loening
Luscombe
Glenn L. Martin
Monocoupe
Pitcairn
St. Louis Aircraft
Seversky
Sikorsky
Stearman
Chance Vought
U. S. Air Corps
Leading Airlines

AMERICAN AIRLINES'
NEW VULTEE V-1A

DZUS FASTENERS



EIGHT REASONS
why leading manufacturers use them

1. LIGHT, COMPLETE ASSEMBLY
   About one-fortieth pound
2. GREAT PHYSICAL STRENGTH
   Tensile strength 1600 pounds
3. SIMPLE TO OPERATE
   A coin or key head will do
4. NEVER VIBRATES LOOSE
   Must be turned to open or close
5. OUTLASTS THE AIRPLANE
   Tested to more than 30,000 cycles
6. CANNOT BE LOST
   Parts permanently attached
7. SAVES SERVICING TIME
   A quarter turn operates it
8. CLEAN IN APPEARANCE
   No knobs, no wires, no gadgets

Aircraft engineers, designers and manufacturers are requested to write on their letterheads for our new illustrated catalog which will be available on or about September first.

DZUS FASTENER COMPANY

BABYLON, L. I., NEW YORK

CABLE ADDRESS: "DZUS," BABYLON, N. Y.

(*Continued from preceding page*)

landing gear. It is possible to retract the wheels as soon as the plane leaves the ground, and the wheels are usually completely up in the wing by the time the plane clears the boundary of the field on the take-off.

The gear itself is composed of a single cantilever duralumin strut of rectangular section, to the upper end of which is fastened a worm wheel segment. The lower end of this strut contains an oleo shock absorber unit to which a stub axle is attached. The wing carries an automatically-operating fairing which closes the wheel well and renders the bottom surface of the wing flush when the gear is retracted. A single cable, running from the landing gear back through the fuselage to the tail wheel, retracts the tail wheel partially as the landing gear is retracted.

Wing flaps are controlled by the same electric motor and auxiliary hand crank which operates the retractable landing gear. This is accomplished by means of a small sliding gear transmission. Either the landing gear or the flap can be operated electrically or by the auxiliary hand crank, or both can be operated together, one by the hand crank and the other by the electric motor. An indicator in the cockpit shows the position of the wing flap and positive stop switches limit its up or down motion.

Tail surfaces, like the wing, are of "shell" type construction, with the fin and stabilizer built integral with the fuselage. An adjustment, similar to that effected by moving the fin, is accomplished by setting an adjustable flap on the trailing edge of the rudder. Similar flaps on the elevators, operated by a wheel in the pilot's compartment, take care of the stabilizer adjustment. This arrangement, particularly in regard to the stabilizer, has outstanding advantages as applied to a high-speed airplane, in which the loads on an adjustable stabilizer becomes sufficiently heavy as to render its operation difficult at high speeds; when the plane is trimmed by means of the small flaps, this difficulty is eliminated.

The fuselage is of true monocoque type, having no longitudinals, a construction which affords maximum possible room inside the structure for given outside dimensions and also provides valuable maintenance features. It has a modified elliptical cross-section, circular arcs of one radius forming the top and bottom, and arcs of a larger radius forming the sides, these radii fairing into one another. A flat Alclad sheet, its long dimensions running transverse to the longitudinal axis of the fuselage, is laid over transverse U-section diaphragms, each panel lapping back over the panel behind it. These panels are relatively short in proportion to the total length of the fuselage, and therefore it is not necessary to form the sheet.

For maintenance in the field, it is possible to remove one or more damaged panels from the fuselage by drilling out the rivets. These damaged panels may be flattened out and, using the flattened panel as a template, a new piece of sheet can be cut and drilled. The new sheet when assembled into the fuselage, is fitted by lining up through the holes. This operation can be performed by any reasonably skilled metal worker, and requires no special jigs or apparatus to keep the fuselage in line.

Precision-ground bolts attached to fittings on the fire wall are used to mount the engine. These units are accurately jig-built so that the power plant assembly (including cowling, oil tank and all lines and engine controls forward of the fire wall) is interchangeable with that of any other V-1A model airplane. Quickly detachable connections are provided for all lines and engine controls so that it is unnecessary to tie up the ship for engine overhaul. Instead, an overhauled power plant assembly can be installed and the ship put into the air again, the removed assembly being overhauled and kept in reserve as a replacement for the next ship requiring servicing.

Other features tending to reduce maintenance cost are the use of SKF and Fafnir ball bearings or other type of non-friction bearings in practically all moving parts of the plane. Control operating assemblies are so located as to be easily accessible for inspection or repairs. Brewster controls are used, the cables leading through Formica pulleys.

Incorporated in the pilot's cockpit is a forward slanting vee-type windshield designed to eliminate glare from lights on the ground and afford good forward vision under all conditions. A complete set of instruments is provided including a Sperry artificial horizon and directional gyro; Kollsman, Pioneer, and Weston instruments are included in the installation. The pilot's cockpit, the passenger compartment and the bulkhead separating them, are completely sound-proofed by Western Electric acoustic engineers. The extensive use of Seapak sound insulating material and noise filters in all ventilators and heater openings has resulted in a passenger cabin with a noise level of 68 decibels which is quieter than a Pullman car. It is possible to talk from one end of the cabin to the other in a normal tone of voice while cruising at 215 m.p.h.

Provision has been made to carry one or two pilots with necessary changes in payload. With two pilots and 1,360 pounds of payload (eight passengers) and 206 gallons of fuel, 69 pounds is available for baggage and mail; with 142 gallons of fuel, 450 pounds is available for baggage and mail.

Flaps on the Vultee V-1A transport in lowered position

Specifications

Wing span	50 feet
Length overall	37 feet
Height overall	10 feet 2 inches
Root chord	11 feet 3 inches
Tip chord	5 feet
Mean chord	8 feet 4 inches
Dihedral (top of wing)	3 degrees

Areas (Square Feet)

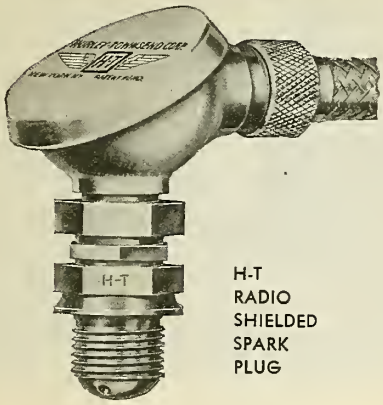
Wing (including ailerons)	384
Ailerons	22.7
Stabilizer	38.6
Elevator (including flaps)	32.5
Fin	9.9
Rudder	14.6
Elevator flap	2.4

Weights (Pounds)	With 206 gal. fuel		With 179 gal. fuel
Weight empty		5332	
Gasoline	1236		1075
Oil (15 gallons)		113	
Pilot		170	
Payload	1649		1810
Gross weight		8500	

Performance

Power plant, Wright Cyclone	735 h.p.
High speed	235 miles per hour
Cruising speed (75% power, at 10,000 feet)	215 miles per hour
Landing speed	60 miles per hour
Climb at sea level	1000 feet per minute
Absolute ceiling	22,000 feet
Service ceiling	20,000 feet
Cruising range	1000 miles

"COOLED" RADIO SHIELDING!



H-T
RADIO
SHIELDED
SPARK
PLUG

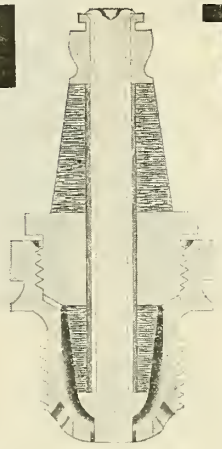
Aluminum radio shield for all type "S" H-T spark plugs, ventilated to prevent condensation.

Large cooling surface prevents burning of ignition cable.

Fits all engines not made with factory spark plug coolers.

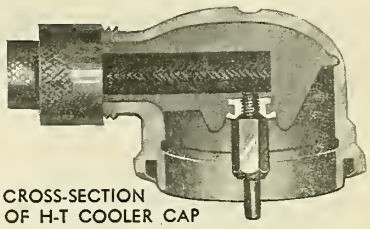
Replacement plugs are the same price as regular type.

H T



HURLEY TOWNSEND CORPORATION

305 East 45th Street, New York City



CROSS-SECTION
OF H-T COOLER CAP

Aluminum cooler cap, with molded insulation contained wholly within the cap, allows direct radiation of heat from the spark plug to the wall of the cooler chamber thus preventing overheating of the spark plug and burning of the ignition cable.

Fits all engines equipped with spark plug coolers. Can be used with any approved mica spark plug. Eliminates throwing away expensive radio shielded plugs in which the shielding is an integral part of the plug.

H-T Spark Plugs, manufactured by Scintilla A. G. Soleur, Switzerland, are available in all foreign countries under the name Scintilla H-T.

SCINTILLA
AIRCRAFT MAGNETOS

are standard ignition equipment on every engine manufactured by The Wright Aeronautical Corp.

Makers of Whirlwind, Cyclone and Conqueror Engines

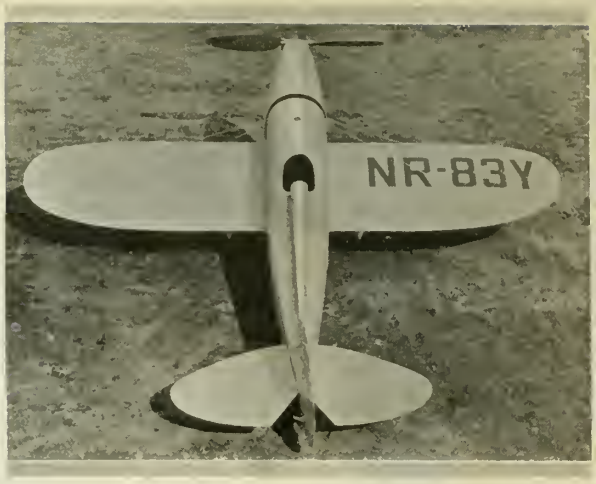
SCINTILLA MAGNETO CO., *Inc.*

Sidney, New York

Contractors to the U. S. Army and Navy

(Subsidiary of Bendix Aviation Corporation)

The Brown Special Racing Monoplane



View from above showing the clean lines and arrangement of the Brown Special racer

● Exemplifying the current trend of design and construction, the Brown Special is a conventionally wire-braced, thin-wing monoplane powered by a Menasco C-4-S Pirate engine. Built at the Menasco Motors plant in Los Angeles, Calif., especially for competition in races restricted to the lower horsepower class, this plane has already demonstrated its speed by winning the Shell Sweepstakes Trophy at the Pan American Air Races in New Orleans with Ralph Bushey, its owner, at the controls.

At present Bushey is making test flights in the plane, preparatory to departure for Cleveland, where he will compete in the 1934 National Air Races.

Throughout the plane are many new features designed by Lawrence W. Brown, its builder. These are evidenced in the venturi-type cowling, the modified Curtiss airfoil with sharp leading edge, the use of two-ply fabric around the leading edge of the wing and the general streamlined appearance of the craft.

Wings are of composite type with solid wood spars, wood ribs, steel tube and wire drag bracing and fabric covering. The fuselage is of steel tube construction with wood fairing and is also fabric covered. The semi-enclosed pilot's cockpit provides comfort and visibility, ease in operating controls and observing instruments. In addition, visibility has been enhanced by the attention given to the lines of the cowling around the engine (especially at the nose) and to the juncture of the wing and fuselage which is not heavily filleted.

The landing gear struts serve as major wing brace members, there being no provision for shock absorption except for that supplied by the small air wheels. Although these wheels represent the chief element of parasitic drag on the plane, they have been sufficiently enclosed in wheel-pants to reduce this drag to a minimum.

The Menasco engine, which with supercharger delivers 185 h.p. at 2800 r.p.m., is bolted direct to the engine mount, and due to its relative freedom from vibration it has been found unnecessary to incorporate any engine cushioning. The engine has a displacement of 363 cu. in., and weighs, dry, approximately 300 pounds. A special 6-foot metal propeller developed by Story from Hamilton Standard is used. Provision is made to carry 20 gallons of fuel and 3 gallons of oil.

The designer has dispensed with the use of a retractable landing gear or flaps in this plane which is the second of a series of racers he has constructed. A third, powered by a Menasco six of 550 cu. in., displacement is now nearing completion while a fourth is already under construction.

One of these ships is being constructed for Roy Minor, who flew Ben Howard's "Mike" last year and won more first places than any other pilot in major speed events. The ship being constructed for Minor to be entered in the 550 cubic-inch classes this year, will be powered by the Menasco Model C-6-C engine of 544 cubic inches. This ship will incorporate in its design a bullet nose and wing flaps. This job, which Minor has financed himself, will be named "Miss Los Angeles."

Lawrence W. Brown is one of our pioneer pilots, and a member of the Early Birds. He flew a Christofferson pusher for Carranza in the Mexican revolution of 1915. Brown originated such designs as the Kreutzer (first introduced as the Brown "Mercury"), one of the first multi-motored small airplanes in this country. Later he designed and built the "California Cub," a stock A. T. C. airplane which he flew in competition with racing types; with this ship he flew to sixth place in the Cirrus Derby. His present series of racing planes are expected to demonstrate high performances at forthcoming air races.

Specifications are as follows:

Wing span	16 feet 8 inches
Overall length	16 feet 9 inches
Weight dry	680 pounds
Weight gross	964 pounds
Wing loading	19.2 lbs./sq. ft.
Power loading	5.21 lb./h.p.
Top speed	235 miles per hour

The Brown Special, powered with the 4-cylinder 185-h.p. Menasco C-4-S Pirate engine

Omaha Races to Be Held This Month

THE DATES for the fourth annual air show at Omaha, Neb., have been set for August 11-12 and $5,000 in prizes is to be offered in the air races. M. M. Meyers, president of the Omaha Air Race Association is in charge of arrangements while Jim Ewing is managing director of the races.

All three of Ben Howard's racing planes are already entered, and it is reported that Harold Neumann is to pilot one, Art Davis or Roy Hunt another and Joe Jacobson will pilot the third. Roger Don Rae, Gordon Israel and Art Chester have also entered the events.

A special sweepstakes trophy for the most outstanding flier in the Omaha meet has been offered by Dr. John D. Brock, while an aerobatics championship trophy will be presented by the management. Wayne Wagner is to make an attempt to set a new world's altitude parachute jump.

Sanctioned by the N. A. A. and conducted under F. A. I. Rules, the association expects to have some of the outstanding pilots of the country attending. Entry blanks must be in Omaha by August 9.

Chicago Girls' Club Meets

MEMBERS OF the Chicago Girls Flying Club, all of whom are either licensed pilots or active flying students, were recently entertained at the home of Mrs. Phoebe Terry who invited George Spaulding, vice-president of the Northern Trust Bank and a former R.A.F. flyer as guest speaker.

The club is headed by Margaret McCormick, president; Betty Dalling, vice-president; Alice Adamec, treasurer; Adela Adamec, secretary and Marguerite Dickman, publicity manager. Miss Alice Walker is business secretary.

Air Tour to Attend Regatta

THE THIRD annual air cruise to the Inter Lake Yachting Association Regatta at Put-in-Bay, Ohio, will be held August 21. Besides the sportsmen pilots who will fly to the affair from Detroit, Cleveland and Erie, the Detroit Hangar of Q. B.'s have voted to make it an annual field day at the island resort with golf and sailing races scheduled.

Put-in-Bay affords a field 1100 feet square with low approaches on all sides.

Walter X. Brennan of Detroit is chairman of the committee in charge.

Marion, Ill., to Have Air Meet

ARRANGEMENTS FOR the Southern Illinois Air Races are now being made at Marion, Ill., in preparation for the two-day event, August 4 and 5.

One of the features of the meet is to be a 100-mile cross-country derby from St. Louis to Marion. Other events will be closed course races, speed dashes, aerobatics, inverted flying and fireworks.

Arnold M. Marquis is director of the races which are sponsored by the Williamson Post 147, American Legion.

THREE SAFAIR WOMEN GET PILOT LICENSES

IN ONE month three women students of the Safair School of Aviation, Roosevelt Field, Mineola, N. Y., received pilots' licenses. They are Miss Meta Rotholz, transport; Miss Majorie Kelly, private, and Mrs Hermelinda Briones, private. Mrs. Briones is from Ecuador and is one of the first of her sex in that country to learn to fly.

Pilots' Association Organized

ROCHESTER PILOTS Association, Inc., has been formed at Rochester, N. Y., to promote aviation in all its branches Membership at present consists of 130 persons each holding a Department of Commerce license. Plans are underway to extend the scope of the organization and neighboring towns and cities are being canvassed for new members.

The association held its first annual air show at the Rochester Airport recently with E. B. Delano, secretary of the organization acting as manager of the event. A. C. Lohman is president; G. W. Finegan, vice-president and H. M. Shafer, treasurer.

Flying Club Formed

ORGANIZED FOR the promotion of flying as a sport, and aviation as an industry, a group of Santa Monica, Calif., aviation enthusiasts have formed a club known as the Avigators. They conduct weekly ground school courses for their members and a flying course for those who desire to fly.

A number of members already are taking flight instruction and more are expected to solo in the near future. Officers are Richard Allen, president; Edward Russell, vice-president and Albert Whale, secretary.

State Fair Features Aerobatics

THOMPSON BROS., Balloon and Parachute Co., Aurora, Ill., has been awarded the contract for making a series of delayed parachute jumps and balloon ascensions each day at the 1934 Wisconson State Fair. According to V. E. Thompson this is a return engagement for the company's jumpers and balloonists at the state fair which will be held from August 25 to 31.

Operators Set Safety Record

A RECORD in passenger safety, believed to be unequalled in any other form of transportation, has been made by the members of the Stinson Air Cab Operators' Association when their planes flew 3,415,620 miles in the last twelve months without injury to a single passenger.

The 103 operators, located in as many cities in the country and making up a national association, was formed May 31, 1933, with Neil R. McCray, owner of McCray Air College, Erie, Pa., president.

The organization was intended primarily to make available to the aircab owner improved methods of operation, reduce costs and to give to the public a more uniform air taxi service. Many of the operators act as feeder lines to the regular transport airlines; all use Stinson cabin planes.

Women's Air Unit Elects Officers

THE WOMEN'S International Association of Aeronautics will endorse a program of world peace and encourage and boost air mail usage and air race events, according to Mrs. Ulysses Grant McQueen, founder and honorary president.

After a check of ballots received from this and other countries, Lady Hay-Drummond-Hay was elected president and Ruth Nichols, re-elected vice-president.

14 Planes in Seaplane Cruise

THE FOURTH annual invitation seaplane cruise was made this year by 14 planes carrying about 40 persons to Wellesley Island in the St. Lawrence River. Commanded by Richard F. Hoyt, the armada got under way from the Sands Point Bath Club, Manhasset Bay, Long Island, and proceeded to the Thousand Islands after a stop on Oneida Lake.

George B. Post was fleet captain and R. R. Loening chairman of the regatta committee. Hoyt flew in the new Courtney amphibion, and among the other planes in the junket were the Loening Monoduck, Commuter, Sikorsky, Savoia Marchetti and a Fleet and Waco on floats.

12,000 at Menominee Air Races

APPROXIMATELY 40 pilots competed in the second annual Upper Peninsula Air Meet at the Menominee County airport sponsored by the Oscar Falk Post, American Legion. More than 12,000 people attended the races.

The small plane race, open to pilots with planes of 150 horsepower or less, was won by C. J. Wittman, piloting a plane of his own design with Marcellus King, second. H. Skelley won the annual air derby, defeating Lieut. Walter Arntzen by a full minute.

The feature of the show was the 10,000-foot jump made by Clem Sohn.

Nebraska Active in Airport Work

AIRPORT DEVELOPMENTS in Nebraska this summer are more extensive and numerous than during any previous period with the exception of 1928 and 1929. Fields have been purchased or leased and thousands of dollars worth of equipment added by municipalities in every section of the state.

The Omaha Municipal Airport leads in the work done, adding equipment and making developments costing close to $20,000. Routes entering the city include those of Hanford Tri State Airlines, Rapid Airlines and United Air Lines, the airport now dispatching 12 planes daily in four directions. The airport is the new divisional headquarters for United's 908 miles of transcontinental route between Cheyenne and Chicago and 570 miles of connecting routes.

At Broken Bow, in north-central Nebraska, the city council has leased a section of land for an airport and the government is providing $4,000 for improvements; at McCook the city council has leased ground and $8,500 is being spent for improvements. Wayne is spending several thousand dollars to develop a new airport, while the municipal airport at Gordon has been so well developed that it is considered one of the best in the northwestern section of the state. Hastings has purchased the Great Plains Aircraft Corp., equity in a hangar, has taken over the operation of the Hastings Airport and is now making needed improvements.

Twenty-eight cities and towns in the state have installed air markers bearing the name of the town or city.

Unlighted Fields Marked

AMBER-COLORED course lights are being installed on some of the Department of Commerce rotating airways beacon lights throughout the country to inform airmen of the presence of airports which do not have lighting equipment continuously available for night operations.

The amber lenses are installed in a beacon's course lights, which are fixed projectors pointing the direction of the airway, and flashing a code signal which tells airmen the number of the beacon. When a beacon is located adjacent to a lighted airport or Department of Commerce intermediate landing field, the course lights are green. When no landing area is available in the vicinity, the course lights are red. The amber color has been adopted to show the presence of an unlighted field or a field which operates its lights only at specified times and does not have an attendant present to turn on the lights for unheralded arrivals.

STURGIS, MICH., GETS LAND USED AS MUNICIPAL PORT

THE 115-ACRE tract on which the municipal airport now stands has been deeded to the city of Sturgis, Mich., by the heirs of C. W. Kirsch. The field will be named after the benefactor and will remain in possession of the city as long as it is used for airport purposes.

Operator Enlarges Quarters

AIR PARTS CO., Glendale, Calif., recently completed renovation of their entire building and have added a larger stock room and new fixtures.

This company, which maintains a twenty-four-hour repair and service unit, reports an increase of 200 per cent in their business over 1933. It recently was appointed Pacific Coast sales and service representative for Szekely engines and parts.

Blair Operating Fixed Base Service

BOB BLAIR has taken over the lease of one of the large hangars at the Los Angeles Municipal Airport and reports almost all of the storage space taken by private plane owners and the renting of the service shop.

In addition to his aerial taxi service and motion picture operations, Blair has just consummated a deal by which he became Southern California distributor for Stinson aircraft.

Cornish New Airport Manager

CAPTAIN CLARENCE F. Cornish has been appointed manager of the Paul Baer Municipal airport at Fort Wayne, Indiana, to succeed Captain Robert Bartel, who was scheduled to retire from management August 1. Captain Cornish has been manager and chief pilot of the Aereco Flying Service, with headquarters at the port, a position which he has held since 1928 and from which he has resigned to take the new appointment.

Hot Springs Airport Completed

SOME TIME ago a series of airport improvements were begun in Arkansas as CWA projects under the general supervision of Charles Taylor, state airport project director of Little Rock. The first one of the projects to be wholly completed is that of the Hot Springs National Park airport, with A. F. Annen, Hot Springs engineer, in charge.

An 18-plane hangar has been built to replace the 3-plane structure. Four hundred feet have been added to the north-south runway to bring it up to 2,900 feet and 700 feet has been added to the east-west runway to make it 2,500 feet.

The entire field has been fenced, standard markers installed and the field itself leveled and generally improved to make it possible for the largest size plane to take off or land.

On completion of the job the Hot Springs Chamber of Commerce held its annual meeting on the field and hundreds turned out for the occasion.

Utica Field Progressing

WORK ON improving the Utica Municipal Airport in Marcy, N. Y., is progressing rapidly, it was reported by Reginald I. Heath, airport superintendent. Between 75 and 80 men are employed, putting finishing touches on a 150 by 200 foot asphalt apron in front of the hangar, and in finishing the ditching work started earlier in the season.

Grading of the enlarged airport will be the last part of the program, and it is expected that work will last most of the summer.

Ft. Meade Field Improved

THE FIRST of three runways to be constructed at the Fort George G. Meade's new air field in Baltimore, Md., which has just been completed, has been built by a new process which is designed to give it a "sponginess" helpful in landing and taking off. The completed runway is 2,000 feet long and 150 feet wide and runs southeast-northwest.

Work upon the second runway, extending 1,800 feet from southwest to northeast, has been started and the third to be constructed will connect the northern ends of the cross formed, running 1,200 feet from east to west.

The new process used in the construction provides for repeated applications of oil to plowed ground, which is then rolled.

Garrett Heads Airport Group

WITH LOUIS Garrett again head of both groups, officers and directors of the Arkansas Airport Company, operator of Toney Field at Pine Bluff, Ark., and the Pine Bluff Airport Club, have been elected.

The officers, all re-elected are: Jo Nichol, treasurer; L. E. Leas, assistant treasurer and secretary. Airport Club: W. I. Payne, vice-president; Fred Ingram, vice-president; L. E. Leas, secretary and treasurer.

Airport Club directors are: Dr. B. D. Luck, Kenneth Garrett, George H. Adams, Fred Ingram, O. C. Hauber, Adams Robinson, Harry Miller, Pinchback Taylor, W. I. Payne, C. S. Lynch, F. R. Broom, F. W. Bellingrath, L. E. Leas, Walter N. Trulock and L. Garrett. Airport company directors are: L. Garrett, George H. Adams, F. C. Smart, K. G. Garrett and W. L. Toney.

New Overhaul Base at Cleveland

GENERAL AIRMOTIVE Corp., the new Cleveland, Ohio, aviation group which took over the former Smith Engineering hangar at the Municipal Airport, has completed the installation of special servicing equipment and will specialize in repairing and overhauling planes and engines, and in offering service and storage facilities to visiting pilots. James W. Borton is general manager.

While temporarily concentrating upon sales, minor servicing and storage, Borton is negotiating with several leading engine manufacturers relative to re-establishing the same aircraft and engine servicing program he developed as operations manager, from 1929 to 1933, of the old Thompson Aeronautical Corporation's Cleveland base. This involves the probable renewal of service dealerships for Wright, Pratt & Whitney, Kinner, Scintilla and other parts manufacturers.

Spearfish Airport Dedicated

LAWRENCE COUNTY'S new airport at Spearfish, S. D., was dedicated with a program including seven contests for pilots with $600 offered as prize money. The Black Hills air fair and dedication was sponsored by the Black Hills Aero Club. The airport is designed to serve five cities.

Constructed partly with federal relief funds, the new 160-acre airport, located four miles east of Spearfish and ten miles north of Deadwood, has a 90 by 100 foot stone hangar and 3,700-foot runways.

Operators Open Air Service

ROY R. TAYLOR and M. M. Taylor, transport pilots, have organized the East Texas Flying Service at Kilgore, Texas, in the East Texas oil fields, and are doing local and long-distance flights and passenger carrying in addition to giving flight instruction.

Air Show Given by Tourists

SEVERAL THOUSAND persons and scores of planes were present at the airport in Idabel, Oklahoma, for an air show and circus, given as a part of the tour made by the Oklahoma City Aviation Club. More than forty planes made the trip as well as several government aviation officials and others. The itinerary included an inspection of many newly-built airports over the state.

Show Features Port Anniversary

THE ANNUAL air show commemorating the anniversary of the municipal airport at Birmingham was held July 23. Two days before the show a tour of the state was made under the direction of Lieut. Col. Sumpter Smith.

The committee handling the show included Col. Smith, chairman, Hayden Brooks, Col. John Currie of Maxwell Field, Montgomery, Major Henry Badham of the Alabama National Guard, Asa Rountree, Jack Moose, E. W. Stanford, Joe Fox, R. J. Ward and Hugh N. Starnes.

New Sites Surveyed for Airport

NINE POSSIBLE sites, each within 10 miles of town, have been surveyed for the possible location of Nashville's new airport, if it is secured. It was pointed out that the city is in need of a field nearer the city, as it now takes about an hour to go from downtown to Sky Harbor located near Murfreesboro.

A site was tentatively selected near Andrew Jackson's historical homesite, but because of opposition other sites are being investigated.

Airport Transmitter Installed

GEORGE McCAULEY of Aeronautical Radio Co., Roosevelt Field, announces that arrangements have been completed for the installation of a Western Electric airport transmitter at the Operations Office, Roosevelt Field. This transmitter, which will operate on the itinerant fliers frequencies allowed to this service by the Department of Commerce, will be in operation at all times and is now being installed by the radio company, agents for Western Electric aircraft and airport equipment.

New Company Organized

ARTICLES OF incorporation were filed by Heart of the Lakes Airways, Inc., Lake Delton, Wis. The firm, incorporators of which are R. M. Hines, James H. Hill and James H. Hill, Jr., has been capitalized at $20,000.

Airport Reports Revenue Loss

OKLAHOMA CITY'S revenue from the municipal air terminal dropped approximately $5,000 a year as the result of cancelation of air mail contracts, figures assembled by William Bleakeney, manager, showed. The loss developed after May 12 when United Air Lines flew its last schedule, with resultant lost rent of terminal offices, landing fees, and handling charges on gasoline. Loss of the account is counterbalanced to some extent by removal of Braniff Airways, Inc., planes to the municipal air terminal.

MORE AIRPORT FUNDS SOUGHT TO COMPLETE PROJECTS

PLANS WHICH will result in obtaining $40,000 in additional funds for completing work on 43 airports in Oklahoma are being completed. The work will consist of marking and draining the airports. Twenty-five of the ports are completed except for this work, while additional construction is necessary at 18 others.

Airport Reopened

HAMPTON AIRPORT, located in Oak Cliff, the western suburb of Dallas, has been renovated and improved and is now being operated by Claude Gossett after being closed for more than a year. Gossett is operating a flying school and conducting a general fixed base business. A steel hangar and office building are on the field.

Dallas Plans Fuel Sales

IN ORDER that it may abolish the gasoline tax and still obtain revenue to pay operating expenses at Love Field, Dallas, the city is contemplating the construction and operation of its own fuel station at the field, banning private purveyors of gas and oil. Another plan is to reduce the fuel tax, now three cents a gallon, and let the fuel franchise out to some private vendor.

Winburn Field Leased

THE CITY Commission of San Antonio has leased Winburn Field, the municipal airport to Long and Harmon, Inc., of Dallas for one year. The company operates the south Texas air mail line from Dallas to San Antonio and is also operator of Dallas Aviation School, Dallas, but will operate Winburn Field as a separate enterprise.

The company and Bowen Air Lines are the only airlines making scheduled stops at the field, but a number of private operators have their headquarters there.

Love Field to Be Improved

IMPROVEMENTS PLANNED for Love Field, Dallas municipal airport, include the construction of a ramp in front of the proposed $50,000 administration building, more accommodations for visiting pilots and planes, and an emergency hangar. Additional equipment is to be available for hangars operated by the city with money for the improvements planned during the next fiscal year.

Six Ports Get Entry Designation

AIRPORTS IN the states of Montana, New York and Washington were recently designated as official airports of entry for the landing of aircraft from foreign countries. The designation is for a period of one year from June 2, 1934.

The following airports have received the airport entry designation: In Montana; the Great Falls Municipal Airport, Havre Municipal Airport and Scobey Airport; in New York: the Watertown Municipal Airport and Mobodo Airport in Plattsburg and in Washington, Felts Field, the Spokane Municipal Airport.

Hawley Takes Over Planes Agency

HAWLEY AIRCRAFTS Co. has been appointed eastern distributor for Security National Aircraft Co., and for the new Lockheed Alcor. Murray Hawley, manager, is operating from Hangar 9 at Roosevelt Field, Mineola, N. Y., where a new Security Airster is being flown for demonstration.

Nancy Hawley will assist her brother in the sales, distribution and demonstration of these planes. Both have been flying since they were 16 years of age.

Used Plane Sales Unit Opened

DYCER AIRPORT, Los Angeles, Calif., has established a Used Plane Sales Department and plans to carry 20 planes of various types on hand. Ace Bragunier is in charge of the unit.

Further activity at the field got under way when the Fitzgerald Brothers, formerly of Sweetwater, Texas, established an aircraft and engine repair shop.

Montana To Complete Airports

MONTANA HAS been allocated $59,000 for the completion of more than a score of airport projects in the state, the money being made available by Relief Administrator Hopkins to be administered by the state relief commission. Work yet to be done to complete a system of airports throughout the state will be carried out as FERA projects. As the initial program of airport development was carried out under the original grant of funds for this purpose, airports on contemplated regular air routes were first completed. Most of these afforded ready emergency landing fields on routes then in operation across the state.

Lighting Equipment Installed

UNION AIRPORT, Lincoln, Neb., is being furnished with night lighting equipment which is expected to be operating within a short time.

The equipment consists of 41 boundary lights, which take in about 220 acres, four 1500-watt floodlights placed at the ends of the asphalt runways, a million candlepower two-end beacon, a ceiling projector and all necessary obstruction markers.

Raymond Appointed Chief Engineer

FROM AIRCRAFT mechanic in 1925 to engineering head of one of the world's largest manufacturers of military and commercial planes marks the rise of A. E. Raymond, newly appointed chief engineer of the Douglas Aircraft Company, Inc., Santa Monica, Calif., according to Donald W. Douglas, president.

Raymond, who succeeds J. H. Kindelberger, chief engineer of Douglas since 1925, who resigned to assume an executive position in the East, graduated from the Massachusetts Institute of Technology and entered the Douglas employ as a workman in 1925. From then on his rise was rapid, and in 1928 he was appointed assistant chief engineer, which position he held until his recent promotion.

During the last two years, Raymond has devoted most of his time to the general supervision of design and development work of the Douglas airliner, 75 of which are being built on order of T. W. A., other airlines, foreign governments and industrial concerns throughout the world. Since 1927, Raymond has also served as assistant professor of aeronautics, California Institute of Technology, at which institution he has followed closely the wind tunnel tests of the Douglas transport and other outstanding airplane developments.

Other promotions in the Douglas engineering department include F. W. Herman, former project engineer on the Transport, to general assistant to Chief Engineer Raymond; G. D. Brown, former head of the material and release group, to assistant in the coordination of engineering and sales; D. J. Bosio, former project engineer on the 0-2 series observation planes, assistant in scheduling engineering work; C. T. Reid, former chief clerk, to assistant to Chief Draftsman Howard D. Houghton; E. F. Burton, to senior designer; and Leo A. Carter, to chief of structural analyses.

LOCKHEED FRANCHISE GRANTED FOR CHINA

AN EXCLUSIVE distributorship for Lockheed aircraft in all of China (including Manchuokuo) has been granted to Hasken Trading Co., Inc., New York and Shanghai, importer of aircraft, locomotives and heavy machinery. The arrangement includes an option to secure an exclusive license to manufacture the Electra, Orion, Altair and Vega planes in China.

Fire Destroys New Arup Plane

THE NEW two-passenger model of the single-wing Arup plane just completed by the Arup Manufacturing Co., South Bend, Indiana, was destroyed by fire in its experimental hangar at the old municipal airport on the outskirts of that city.

The new model, powered by a 70-horsepower LeBlond engine, and more powerful and speedy than the original model demonstrated before army authorities in Washington last spring, has been in course of construction for the last three months. It was removed to the abandoned airport for private tests, and had successfully met requirements in the week it was under trial.

Douglas transports on the fuselage assembly line in the Santa Monica factory

Federal Unit to Develop Small Plane

DECLARING THAT the Department of Commerce has in the past spent millions of dollars to aid air navigation and in air regulatory work for commercial aviation, but has contributed little toward increasing the safety of the airplane itself, Eugene L. Vidal, Director of Air Commerce of the Department of Commerce, announced the organization of a Development Section in the Bureau of Air Commerce to foster the development of safer flying equipment.

Authority to engage in such a program was given by Congress in an amendment to the Air Commerce Act of 1926. Congress also appropriated to the President $1,000,000 to use at his discretion in connection with the further development of civil and military aviation and $100,000 of this appropriation has been allocated to be spent under the direction of the Department of Commerce.

John H. Geisse, Chief of the Manufacturing Inspection Service, has been selected to head the unit, Vidal said, adding that the private use of aircraft has been retrogressing and there has been a corresponding lag in development work on equipment suitable for the private owner. Sufficient fundamental knowledge is now available to improve materially the safety of private flying and the Bureau of Air Commerce intends to assist the industry where possible in the application of those principles to the production of airplanes for the average citizen who wishes to fly but has not the time nor the desire to become an expert pilot."

Vidal further stated that the scope of the activities of the Development Section will be necessarily limited as expenditures, other than those made possible by the President's allocation, will have to be kept within the present appropriation to the Bureau.

The Development Section will take over supervision of the acquisition by the Department of Commerce of twenty-five small, two-seater, inexpensive airplanes to be used by the aeronautical inspectors, bids for which will be opened August 27.

Beech Distributor in Philadelphia

J. V. DALLIN and Lewin B. Barringer have formed Beechcraft Distributors, Inc., for the distribution of Beechcraft airplanes in southeastern Pennsylvania, southern New Jersey, Delaware, the eastern shore of Maryland and counties including Baltimore.

A new Jacobs-powered Beechcraft, to be used as a demonstrator, has already been purchased.

Offices are located at the Philadelphia Airport, in the same building as those of Dallin Aerial Surveys.

Four Beechcraft Sold

INCREASING ACTIVITY is noticeable at the factory of the Beech Aircraft Co., Wichita, Kan., following the sale and delivery of a number of aircraft in the past few weeks.

The Ethyl Gasoline Corporation of New York has taken delivery of a 420 h.p. Beechcraft while the Goodall Worsted Co., Sanford, Me., is flying its new 690 h.p. job for executive and business purposes. Another job, this one powered by the Jacobs 225, has been delivered to the Socony Vacuum Oil Corporation of New York and Mrs. Amy Mollinson has ordered another Jacobs powered plane which will be delivered this month. Mrs. Mollinson has taken over the Beechcraft distributorship for the British Isles.

Shot-Welded Plane Back From Tour

AFTER SPENDING two years in Europe where it was exhibited in many countries, the all-steel Savoia Marchetti amphibion is now back in this country. The plane, property of the Edward G. Budd Manufacturing Co., Philadelphia, Pa., was built three years ago to demonstrate the practicability of the shot-welded process of fabricating stainless steel.

Upon its return to the United States, the plane was turned over to Fleetwings, Inc., Roosevelt Field, licensee of the Budd company in this country. Other licensees are in Italy, France and England.

General Tires On New Airliner

ACCEPTANCE OF the General Streamlined wheels and tires produced by the General Tire & Rubber Co., Akron, Ohio, is seen in an announcement by Ray W. Brown, in charge of General's aeronautical sales, that Transcontinental & Western Air, are making an installation in the new Douglas airliner.

Brown also reports that Seversky Aircraft Corp., Farmingdale, N. Y., has standardized on General's streamlined tires and Automotive Fan wheels on his new high-speed monoplane and that Beech Aircraft Corp., Wichita, Kan., is using standard equipment on the new Jacobs-powered Beechcraft.

Digest of Recent Events

Adamowicz Brothers Fly Across Atlantic

BENJAMIN AND Joseph Adamowicz, soda-water manufacturers of Brooklyn, N. Y., successfully made a trans-Atlantic flight in a Bellanca from Harbor Grace, Nfld., to a point near Flens de Lorne, France, falling short of Warsaw, their goal, where they finally arrived after two more attempts. The men took off from Floyd Bennett Field, Brooklyn, N. Y., and after a 9½-hour flight landed at Harbor Grace, where they prepared for their ocean crossing the following day. JUNE 28-JULY 1.

duPont Sets Glider Altitude Record

NOT CONTENT with owning the world's distance record, Richard duPont also annexed the American altitude record for gliders when he attained 6,224 feet in a flight lasting an hour. duPont flew the Albatross I to make this new record. The former mark was held by Jack O'Meara at 4,780 feet; the world's record is 8,439 feet. du Pont was named national glider champion for the year. JUNE 30.

Graf Zeppelin Makes First Visit to Buenos Aires

FULFILLING A dream of long standing, Dr. Hugo Eckener brought the Graf Zeppelin into Buenos Aires for a visit lasting 1 hour 10 minutes. The ship carried 18 passengers and 20 sacks of mail destined for Rio de Janeiro and Friedrichshafen. This is the first time the Graf has entered Buenos Aires and the event was the occasion for the declaration of a holiday. JUNE 30.

Claims Glider Record After 13 Hours in Air

AN AMERICAN record for continuous flight in a primary glider was believed to have been established by Floyd Artman, who remained aloft 13 hours 30 minutes in a ship of that type at Oroville, Wash. Artman was forced down after dark when the wind ceased. JULY 9.

Navy Pilot Makes Fast Daylight Flight

MADE AS part of the regular schedule for ferrying planes from coast-to-coast, Lieut. William G. Tomlinson, U. S. N., flew a new Grumman SF-1 scouting plane powered by a Wright Cyclone engine from the Naval Air Station, Anacostia, D. C., to the San Diego Naval Air Station in 15 hours flying time, the fastest yet accomplished for a flight of this nature. This flight was also the first to be accomplished in one day by a standard Navy plane during ferrying operations and won for Lieut. Tomlinson the commendation of Rear Admiral Ernest J. King, Chief of the Bureau of Aeronautics. JULY 10.

Soviet Flier In Record Parachute Drop

WHAT IS believed to be a new world's record for parachute jumping, was made by Nikolai Yevdokimov, professional parachute jumper of the U. S. S. R., when he bailed out over the outskirts of Leningrad at 26,575 feet and then dropped 25,925 feet before pulling the rip cord. The drop took about 2½ minutes. There is no official recognition of parachute drops and jumps, but the previous longest delayed jump on record was held by John Tranum of England at 17,500 feet; this record also was subsequently broken by a Russian jumper in the Soviet Air Force. JULY 18.

Macon Flies 1,200 Miles to Deliver Papers to Roosevelt

THE NAVY dirigible *Macon* made contact with the cruiser *Houston* carrying President Roosevelt to Hawaii 1,200 miles off the Pacific Coast. In a series of maneuvers by the ship and her planes, papers were dropped aboard the cruiser, after which the *Macon* turned about and proceeded back to her base in Sunnyvale, Calif. JULY 19.

Service Planes Start Flights to Alaska

TWELVE NAVY seaplanes and 10 U. S. Army Air Corps bombers took off for a flight to Alaska. The Navy planes started from San Diego, Calif., and are proceeding by short flights to the Aleutian Islands by way of Astoria, Seattle, Ketchikan, Juneau, Cordova, Seward, Kodisk, Dutch Harbor and Sitka. The Army planes made Washington, D. C., their take-off point. JULY 20.

Coming Events

Rhoen Soaring Contest

Fifteenth Rhoen Soaring Contest, Wasserkuppe, Rhoen, Germany. Sponsored by Deutsche Luftsport Verband. Total prizes, $20,000. JULY 22-AUG. 5.

Air Show

National Air Show of Italy. Milan, Italy. AUG.-SEPT. 30.

Air Tour

Third Air Tour Around Italy. AUG. 1-15.

Women's Air Meet

Women's National Air Meet, Dayton Municipal Airport, Dayton, Ohio. AUG. 4-5.

Illinois Air Races

Southern Illinois Air Races, Marion, Ill. Sponsored by Williamson Post 147, American Legion. Arnold M. Marquis, director of races. AUG. 4-5.

Omaha Air Races

Fourth Annual Air Show and air races. Omaha Municipal Airport, Omaha, Neb. Under management of Omaha Air Race Association, Omaha Chamber of Commerce. AUG. 11-12.

Air Cruise

Third annual cruise to Inter Lake Yachting Association Regatta, Put-in-Bay, Ohio, from Detroit. AUG. 21.

Polish Tour

International Touring Challenge of the Polish Aero Club. AUG. 28-SEPT. 16.

National Air Races

1934 National Air Races, sponsored by National Air Races of Cleveland, Inc., and under the management of Clifford and Phillip Henderson, 103 Terminal Tower Bldg., Cleveland. To be held at Cleveland Municipal Airport. AUG. 31-SEPT. 3.

European Circuit

Circuit of Europe flight and speed contest. Challenge de Tourisme International, Warsaw, Poland. SEPT. 7-16

Air Tour

Sixth Indiana Air Tour. Herbert O. Fisher, director of Aeronautics, Indianapolis Chamber of Commerce, Indianapolis, Ind. SEPT. 10-16.

Gliding Contest

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park. SEPT. 15-30.

Bennett Balloon Races

Gordon Bennett Balloon Race. Auspices of Polish Aero Club, Warsaw, Poland. SEPT. 20.

State Officials' Meeting

FOURTH ANNUAL Meeting, National Association of State Aviation Officials, Cheyenne, Wyo. SEPT. 27-29.

MacRobertson Race

London-Melbourne International Air Race. Speed and handicap event. Under regulations of F.A.I. and competition rules of Royal Aero Club. Sponsored by Sir MacPherson Robertson. OCT. 20.

Air Show

Fourteenth International Aero Salon, Paris, France. NOV. 16-DEC. 2.

Air Races to Feature Speed Events

WITH APPROXIMATELY $35,000 set up as prize money, preparations are progressing for the four-day 1934 National Air Races to be conducted at the Cleveland Airport August 31 to September 3. The races will be sponsored by National Air Races of Cleveland, Inc., with Cliff and Phil Henderson again conducting them.

Derbies and races for slower types of airplanes have been eliminated and the races themselves will be for fast aircraft to demonstrate the advance in speed and power made in the past year.

The race program will consist of two events in the 200 cu. in. displacement class; three in the 375 cu. in. class; three in the 550 cu. in. class and one in the 1,000 cu. in. class, the show culminating on Labor Day with the Thompson Trophy 100-mile free-for-all.

Pilots in various parts of the country, eager to set new records and to win prize money are either rebuilding airplanes in which they already have been successful or are having constructed newly designed craft to obtain the maximum in speed. Among these doubtless will be some of the airplanes to be entered in the London to Melbourne race in October. Thus spectators at the National Air Races may see in actual competition the American entries in this outstanding race.

An excellent field is anticipated for the Thompson Trophy race. Among the pilots expected are Col. Roscoe Turner, Lee Gehlbach, Ray Moore, Art Chester, Roy Minor, Ben Howard, Gordon Israel, Lee Miles, Ralph Bushey and S. J. Wittman. There is also a possibility that Jimmy Haizlip will return to speed competition in this event.

There is some hope that Harry Williams, the Louisiana millionaire, will complete the airplane which was being constructed for the late Jimmie Wedell for the MacRobertson race.

Aside from the closed course races at the Cleveland Airport, chief interest will be in the Bendix Transcontinental dash with its $10,000 prize money and an additional $2,500 to the pilot that sets a new record from Los Angeles to New York. Weather permitting, pilots in this race are to take off from Los Angeles the morning of Friday, August 31st, for Cleveland. Then, if a chance for a new record is possible, the pilot will fly on to New York. The Bendix race was won in 1933 by Turner and here again, he is expected to be a main competitor.

Arrangements are being made for time marks in the Shell 3-kilometer straightaway speed dashes.

The program for the four days will be so embellished with other attractions as to provide a variety of aerial entertainment. Cooperation by the Army, Navy and Marines has been assured. Maneuvers by a pursuit squadron of eighteen ships from Selfridge Field can be expected. An added feature contemplated is the appearance of the Army trio from Maxwell Field.

With the bulk of the Naval aircraft on the east coast for the first time in several years, participation by that branch is expected and a squadron of fifteen fighting planes has been invited. Nine fighters and six observation ships from the Marines, forming a composite squadron, have been asked from that department.

Aerial acrobats are also to be shown. The air race management has invited the 1933 and 1934 winners of European acrobatic competitions as well as Milo Burchman, American ace.

Pageants, night flying, parades, parachute jumps en masse and other attractions are also being booked.

The air race program this year is particularly significant as it marks the twenty-fifth anniversary of airplane competition. It was in 1909 in France that Glenn Curtiss, flying at 47 m.p.h., won first honors against other fliers. Recognizing this anniversary, the air race management is building up a historic display and pageant.

S-42 Gets Approval

FOLLOWING THE last of a series of test flights conducted near Bridgeport, Conn., where it was constructed in the Sikorsky Aviation Corp., factory, the S-42, largest flying boat to go into regular scheduled air transport service, was licensed for international service on the South American trade routes.

Col. Charles A. Lindbergh, technical advisor for Pan American Airways, for which the boat was constructed, was at the controls of the 19-ton ship during the test flights.

N.A.C.A. Gets Full-Speed Tunnel

THE NATIONAL Advisory Committee for Aeronautics has been allotted $478,300 by the Public Works Administration for the construction of a 500-mile-per-hour wind tunnel.

This wind tunnel was felt to be of great need. N. A. C. A. researches indicate that airplane speeds upward of 500 miles per hour are attainable, but knowledge is lacking as to the natural laws governing air flow above 200 miles per hour, and consequently higher attainable speeds cannot be used with safety. The necessary new knowledge can be reliably obtained only by scientific investigations in a high-speed wind tunnel of such a nature.

The project not only had the unanimous endorsement of the members of the National Advisory Committee, but also the support of Secretary of War Dern, Secretary of the Navy Swanson, and Secretary of Commerce Roper.

The new tunnel will be constructed at the N. A. C. A. laboratories at Langley Field, Virginia. Eight thousand horsepower will be required to attain an airflow of 500 miles per hour through a test chamber 8 feet in diameter. The wind tunnel which will be built of reinforced concrete with steel plates lining the walls, will measure 154 by 51 by 25 feet high and is expected to be completed within a year.

Airline Votes Dividend

PAN AMERICAN Airways voted a dividend of 25 cents a share to stockholders of record as of July 20, providing the first distribution to stockholders since the system was organized seven years ago. The dividend represents about 1 per cent of the capital invested.

For the past three years the company has registered a steady gain in net income, amounting last year to $1.42 a share after all charges. This compared with a net income of $1.36 a share in 1932, 21 cents a share in 1931 and a loss of $305,271 in 1930.

The system's traffic increased during 1933 and during this year. In 1933 passenger miles increased 40 per cent over 1932 and express volume was up 80 per cent. Gains of about 30 per cent this year over the same period of last year have also been obtained.

13,722 Pilots Licensed

ON JULY 1, 1934, active Department of Commerce licenses were held by 13,722 pilots and 6,541 aircraft according to totals taken from a study made by the Bureau of Air Commerce. A year previous there were 17,958 licensed pilots and 6,874 licensed aircraft, the decrease in the number of pilot licenses being due partly to the reversion of many private and solo licenses to the student grade when the private pilot requirements were raised and the solo license was discontinued. This is shown by the fact that on July 1, 1933, there were 7,551 student licenses, while on the first day of July, 1934, this number had increased to 13,425.

The total number of aircraft, licensed and unlicensed, of which the Department had record on July 1, 1934, was 8,837, while this number on the same day of last year was 9,055. Unlicensed craft (bearing identification numbers only) totaled 2,296 on the first of July, 1934.

Among the pilots' licenses issued were: 7,016 transport, 1,009 limited commercial, 12 industrial, 4,683 private, 374 amateur and 628 solo.

California with 948 led the states in number of aircraft, licensed and unlicensed; New York was second with 816 and Illinois third with 597. Considering licensed aircraft only, California again led with 804; New York followed with 730; and Illinois was third with 519. The greatest number of unlicensed aircraft was in Texas, where there were 149.

In number of licensed pilots, California led with 2,652; New York was second with 1,327 and Illinois third with 858.

There were 590 gliders of which 46 were licensed and 544 unlicensed. Licensed glider pilots numbered 122.

Wright, Damon Get New Appointments

THEODORE P. WRIGHT, vice-president and general manager of Curtiss Aeroplane and Motor Company, Buffalo, has been appointed Director of Engineering for the entire Curtiss-Wright Corporation according to Thomas A. Morgan, president. Wright, who is an outstanding aeronautical engineer, was recently appointed Chairman of the Curtiss-Wright Engineering Policy and Planning Committee, devoting his entire time to engineering planning and to the engineering problems of Curtiss-Wright.

T. P. Wright R. S. Damon

Mr. Morgan also announced that Ralph S. Damon had been elected vice-president and appointed General Manager of Curtiss Aeroplane and Motor Company, at Buffalo, New York. Damon retains his position as president of Curtiss-Wright Airplane Co., of St. Louis, where the construction of commercial airplanes, such as the Curtiss-Wright Condor including both the standard model and the all-sleeper transport plane will be continued.

UNITED STATES LEADS WORLD IN AIR EXPORTS

THAT AMERICAN aeronautical products are now finding more favor in foreign countries and are now more widely used than those of other nations, is disclosed in a report of the American Manufacturers Association. Great Britain, our closest competitor, led in aeronautical exports in 1931 with $8,441,000 in sales while the U. S. exported $4,867,000 worth of aeronautical products. However, in 1933, American sales were $9,203,000 and British $6,210,000.

Stinson Sales Total Half Million

SALES OF the Stinson Aircraft Corp., Wayne, Mich., for the first six months of the company's current fiscal year were worth approximately $500,000, or nearly 300 per cent greater than during the similar period last year, according to B. D. DeWeese, president.

Practically the entire amount of business was done on the new Stinson Reliant, the newest four-place cabin plane designed for commercial and private use, DeWeese said. Sales are expected to increase materially when the new Stinson tri-motored Airliner goes into volume production within the next few weeks.

A sharp increase in export sales was accredited by DeWeese to improved business conditions in the Orient and South America where the needs for air transportation call for rugged and dependable construction of aircraft, outstanding features of American products.

Howell Heads Air Board

THE WIDELY heralded aviation commission, appointed by President F. D. Roosevelt to study aviation in this country, is headed by Clark Howell, Atlanta, Ga., publisher, and consists of Jerome Hunsaker, E. P. Warner, F. K. Lane, Jr., and Albert J. Berres.

By order of the president, J. Carroll Cone, assistant Director of Air Commerce, was chosen executive secretary of the commission.

Military, commercial and private flying will be studied and plans will be prepared for open hearings, expected to start in September. During this month, members of the commission will conduct investigations throughout the country.

New Boeing Gets Geared Engines

AFTER EXTENDED tests at Seattle, Wash., a Boeing transport modified to incorporate features of the forthcoming Boeing 247-D model was flown to Hartford, Conn., for installation of new geared Wasp engines. Known as S1H1-G's, the Wasps will be of the same type as those to be standard equipment on the Model 247-D transports to be delivered to United Air Lines next month and for sale to the general market. The 247-D will have a considerable increase in speed over that shown for the original Boeing Model 247 twin-engined transport.

The plane flown to the Pratt Whitney plant is the first Model 247 produced by the Boeing Airplane Company in 1933, completely changed to the Model 247-D's type.

Low Priced Plane Being Built

ACCORDING TO the Hobart, Okla., *Democrat-Chief*, J. B. and R. L. Cooper, brothers and owners of Sportsmen's Airplane Supply Co., of Hobart, have set up a plant and will attempt to build an airplane to sell for $700 and also meet the approval of the Department of Commerce.

At present the company is building two airplanes, one of which it is hoped will sell for $1000.

Berry Appoints Representative

THE AVIATION Division of Berry Brothers, Detroit, Mich., manufacturers of Berryloid aircraft finishes, announces the appointment of M. C. Lautt as representative in the eastern seaboard states south of New York. Lautt has been flying for many years and at one time headed the aviation department of a well-known oil company. More recently, he was associated with the Bureau of Air Commerce in engineering work in California.

Another recent appointment was that of Harold Acker as Aviation Chemist in charge of all development, testing and research work on aircraft finishes.

Acker was formerly with the Philadelphia Aircraft Factory where he was engaged in developing protective coatings for aircraft.

Kendall Distributor Appointed

ACCORDING TO Howard Ailor of Waco Sales of New York, this company has been appointed distributor for Kendall Oil at Roosevelt Field. Mr. Ailor also announces that the Daily News has taken delivery of a Wright-powered Cabin Waco and Dr. R. G. Tunison has purchased a Waco Cabin on floats to be used in commuting from his country estate to New York City.

(Continued on following page)

(*Continued from preceding page*)

Approved Type Certificates Awarded

THE DEPARTMENT of Commerce, Bureau of Air Commerce, has issued approved type certificates covering seven models of aircraft and three engines as follows:

Stinson Aircraft Corp., Wayne, Mich., model Reliant SR5, four-place closed land monoplane, powered by Lycoming R680-4 engine of 225 h.p. Weights: empty 2200, useful load 1075, gross 3275. A. T. C. No. 530.

Stinson, model Reliant SR5D, four-place closed land monoplane powered by a Lycoming R680 engine of 215 h.p. Weights: empty 2166, useful load 1075, gross 3241. A. T. C. No. 531.

Kinner Airplane and Engine Corp., Ltd., Glendale, Calif., model C7, four-place closed land monoplane, powered by a Kinner C7 engine of 300 h.p. Weights: empty 2530, useful load 1470, gross 4000. A. T. C. No. 532.

Krieder Reisner Aircraft Corp., Hagerstown, Md., model Fairchild 24 C8C, two or three-place closed land monoplane, powered by a Warner Super Scarab engine of 145 h.p. Weights: empty 1321, useful load 773, gross 2094. A. T. C. 535.

Stinson, model Reliant SR5A, four-place closed land monoplane powered by a Lycoming R680-6 engine of 245 h.p. Weights: empty 2315, useful load 1075, gross 3390. A. T. C. No. 536.

Stinson, model Reliant SR5E, four-place closed land monoplane powered by a Lycoming R680-4 engine of 225 h.p. Weights: empty 2250, useful load 1075, gross 3325. A. T. C. No. 537.

Waco Aircraft Co., Troy, Ohio, model CJC, four-place closed land monoplane powered by a Wright Whirlwind R760 engine of 250 h.p. Weights: empty 1976, useful load 1224, gross 3200. A. T. C. No. 538.

Pratt & Whitney Aircraft Corp., E. Hartford, Conn., model Wasp S5D, 9 cylinder, radial, air-cooled engine rated 450 h.p. at 220 r.p.m. at 10,000 ft. Octane 80. A. T. C. No. 124.

May Exports Total $844,181

A SLIGHT decrease in the value of American aeronautical exports was evidenced in May, 1934, when $844,181 was realized from the sale of aircraft, engines, parts and accessories to foreign countries. The total was made up of $550,600 for 33 airplanes, $111,881 for 30 engines and the balance for parachutes, parts and accessories. The export sales for the previous month totaled $1,318,391.

China spent $446,604 for 18 airplanes and parts and accessories, while Colombia spent $54,801 for 2 engines, parachutes and other equipment. Our third best customer during the month was Bolivia, which spent $54,141 for American aeronautical products. Italy spent the greatest amount for engines, $41,439; China for aircraft, $435,204; Colombia for parachutes, $1,250, and Bolivia for parts and accessories, $38,162.

Other countries purchasing American aircraft during the month included Norway (1); United Kingdom (1); Costa Rica (1); Mexico (4); Brazil (4), and Argentina (2).

Aero Chamber To Move To Washington

EXECUTIVE OFFICES of the Aeronautical Chamber of Commerce will be moved from New York City to the Shoreham Building, Washington, D.C., on August 14. The library and general information service of the Chamber are to remain in New York.

Seapak Used For Insulation

ADOPTION OF Seapak as a sound and temperature insulation agent in the new Vultee transport has been announced by the Seaman Paper Co., Chicago, manufacturers of the material. Aircraft Development Corp., Glendale, Calif., are the manufacturers of the Vultee transport.

At present, the material is being used on a number of new transport models including the Douglas, Condor, Boeing, Stinson, Northrop and Lockheed types.

According to George M. Seaman, president of the company, Seapak consists of kapok in flexible sheet, a development evolved after two years of research by the company's engineers.

IMPROVEMENTS IN THE FEDERAL AIRWAYS

(*Continued from page* 17)

and made repeated and unassisted landings. The Department of Commerce previously had conducted blind landings with a small training plane, but it was felt that the real value of the system could not be demonstrated until a large, heavily-loaded transport plane could use it successfully.

Radio eventually may take over some of the functions now assigned to wires. Already the Bureau makes use of point-to-point radio transmitters and receivers for relaying weather information and other messages, to supplement the teletypewriter weather reporting circuits. Experiments are going forward with radio-operated teletypewriters. The machines are much like those operated over telephone wires—a message typed on a machine at the sending stations goes out by radio, is received and operates a typewriting machine at the receiving station. These teletypewriter circuits are used for dissemination of hourly weather reports along the airways, for transmission of weather maps every four hours, and for reporting the progress of aircraft.

If final results of the experiments show that the teletypewriter machines on the Federal Airways System can be operated by radio, this will result in a saving to the government through the elimination of the leased landwires.

Another experimental project in the same general field is distant control of radio range beacons by radio. The method used for starting and stopping radio range beacons by means of a dial switch and a telephone circuit has already been mentioned in connection with distant control. In some cases, where telephone circuits may not be available, the same end may be accomplished by a small, low-powered radio transmitter at the control station and a receiving set at the radio beacon house.

In the routine operation of the teletypewriter weather reporting service during the past year, service to airmen was enhanced in efficiency by distant control of radio stations, bringing all the personnel of an airways communication station into one office where various functions can be better coordinated. Introduction of a symbol method for transmission of weather reports speeded up these transmissions, enabling the teletypewriter system to carry more traffic. Operators have been required to improve technique so that they send 35 to 40 words a minute, the mechanical limit of the system.

Publication of maps for airmen is now a responsibility of the Air Navigation Division. (The actual compilation and printing is done by the Coast and Geodetic Survey.) Eight new sectional airway maps have been issued since July 1, 1933, bringing the total now in circulation to 25. The program contemplates charting of the entire United States with 87 maps of the sectional type.

For the Federal Airways System as a whole, the Bureau of Air Commerce is introducing a maintenance control procedure which will place the operation of the aids to air navigation on a business basis, and give the Department a reliable check on the cost of airway maintenance operations.

From these records complete information can be obtained as to all equipment installed, maintenance work performed, and costs for each unit, for each airways district, and for the entire Federal Airways System.

The reports cover operation of radio and lighting equipment, and isolate causes of failures. The system also involves standardization of procedure wherever possible, and provides for salvaging each piece of equipment that can possibly be reclaimed.

Founded on accepted business practices, the maintenance control system for the airways nevertheless is a pioneering step. The same is true of almost any development that takes place in establishing and maintaining airways, for the Federal Airways System is the only one of its kind in existence.

TRADE LITERATURE

Ort Catalog

• AS USUAL, Karl Ort has just issued a most complete and comprehensive catalog of aeronautical accessories. Contained in this 32-page book are prices and descriptions of almost every conceivable type of accessory, equipment and device needed by pilots, manufacturers and others.

An exceptionally well-prepared piece of literature, this catalog is a veritable storehouse of information of what Ort has for sale at his York, Pa., plant. Written in a light and interesting manner, this book contains all the information desired by a potential purchaser, while at the same time deviating from the usual cut-and-dried style of the every-day catalog and price list.

Parks Training

• MAKING A definite appeal to those persons who are desirous of entering the fast-growing aviation industry, Parks Air College, E. St. Louis, Ill., has prepared an interesting folder telling of the courses taught and the advantages to be derived by an aviation enthusiast who takes them.

Photos of students at work, types of ships used and a description of the multitude of courses given at the school, together with tuition costs, are included. It is an interesting presentation of what the future holds for those with vision enough to get a thorough and practical training in the various arts of aviation.

Spartan School

• A MOST pretentious and comprehensive catalog has just been published by the Spartan School of Aeronautics of Tulsa, Okla. Its pages, telling of the courses offered, are extremely well laid out with the copy and illustrations made up in an alluring style. The photographs show only Spartan equipment, Spartan activity and the instructors of many courses. Such topics as radio, blind and night flying, the ground school, the Dawn Patrol, the mechanics courses and the Spartan factory and hangar, are treated in an interesting and readable presentation. A complete catalog of all courses, tuition, etc., is also contained therein.

Insulated Cable

• A PRESENTATION by the General Electric Co., Schenectady, N. Y., of the information required to determine the cable best suited for a particular application. It is a reference book on insulated cable for transmission and distribution of electric power at normal frequencies entitled "How to Select Insulated Cable."

In this book there is presented an exposition of the advantages and limitations of the various materials available, together with the engineering data required to enable a man, knowing his operating conditions, to decide what type or types of cable will best meet his requirements. While the basic assumptions on which the data were calculated are clearly stated, no attempt is made to present any theoretical consideration either simple or complex.

When several types of cable are technically satisfactory for a given application, the choice is usually an economic one. The subject of cable economics does not properly fall within the scope of this book, and is touched on only lightly to insure that an economic decision will not be based on the price of the cable alone, to the exclusion of other important factors. A complete economic study for any particular application can be made only by getting together the complete costs of the various alternative ways of doing the job and comparing them.

Protective Coatings

• IT HAS been but a few short years since Bakelite Synthetic Resins were first introduced to the paint and varnish industry. In that brief span they have been instrumental in solving many perplexing problems of the trade, and have given the industrial world a new conception of paint and varnish durability.

To prove how naturally Bakelite Synthetic Resins belong in high quality paints and varnishes, and to indicate the extremely wide variety of Bakelite Resins which are available for the manufacture of specialized finishes, the Bakelite Corporation, Bound Brook, N. J., has prepared the 24-page booklet, "Bakelite Synthetic Resins for Paint and Varnishes.

It is written in easy-flowing, non-technical style, is well-illustrated and should be found interesting.

Selling Air Transportation

• UNITED AIR Lines has just completed publication of a brochure which is comparable to the efforts of railroad literature aimed at building up passenger revenue.

It is an attempt on the part of the transport company to foster air travel to the western playgrounds of the United States and is a creditable piece of work from the angle of information, interest, typography and illustrations.

"Fly to America's National Parks" shows the United Air Lines route in relation to its position to the national forests, parks and dude ranches. It pictures some of the outstanding points of interest in these parks and makes a definite appeal to the traveler and vacationist to fly to these wonder spots of the country.

Bronze-Welding

• RECENT ADVANCES in the use of the oxy-acetylene bronze-welding process, have resulted in the publication by The Linde Air Products Co., New York, N. Y., of a new edition of the eight-page pamphlet entitled, "The Progress of Bronze-Welding." Similar in form to previous editions, it contains a comprehensive and instructive story.

The subject matter is arranged so that procedures for work on cast iron, malleable iron, steel and wrought iron, copper, and brass and bronze are each discussed.

In order to satisfy a growing desire on the part of many to know more about the metallurgical aspects of bronze-welding, the company has added another five-page pamphlet to its technical literature. Entitled "The Principles of Bronze-Welding," it discusses the compositions and strength characteristics of bronze-welding rods, the underlying theory of the flowing of bronze-weld material, and certain important elements of welding techniques.

MacRobertson Race

• CONTAINED IN the July 15, 1934 issue of Notice to Aviators, published by the Navy Department's Hydrographic Office, is the most complete data on the London-Melbourne route yet seen and the information contained therein should be of inestimable value to those contemplating entering the MacRobertson race this fall.

The section of the route from London to Karachi contains a description of the airports at the control and checking points as well as descriptions of important intermediate fields. From Karachi to Melbourne general information on the route is given as well as descriptions of the airports.

Location and field sketches of the various control and checking points together with an outline of the entire route have been published on the backs of the Upper Air Pilot Charts of the North Atlantic and North Pacific Oceans. Copies of these charts are available upon request to the Hydrographic Office in Washington or from authorized agents of the office at 10 cents each.

On the London-Melbourne route the following maps and charts are available:

Topographical maps of the interior on a scale of 1:1,000,000; nautical charts of all coasts and sea passages on a scale as far as possible between 1:500,000 and 1:1,000,000; these maps may be obtained from the International Map Co., 90 West Street, New York City, and C. S. Hammond & Co., 30 Church Street, New York City. The nautical charts may be obtained from the Hydrographic Department.

FOREIGN NEWS IN BRIEF

Australasia

THE AUSTRALIAN built Codock has successfully passed all department tests and has obtained its certificate of airworthiness, but its proposed flight to New Zealand has been postponed until after the winter months.

QANTAS EMPIRE Airways has tentatively fixed December 11 as the date of opening of regular air mail service from Australia to England. Passengers will not be carried until early in March, 1935. Four-engined DH 86 airliners will be used and the company has already taken delivery on the first of these high-speed aircraft.

AN ORDER for 24 Seagull V amphibions has been placed by the Department of Defense of Australia which has set aside £345,000 for the planes, parts and spares in addition to tools and materials for repair and construction. Catapults are to be installed on the cruisers *Australia* and *Canberra,* each of which will carry one of the new planes.

Canada

A REPORT of aviation activity in Canada for the first three months of this year shows a growing interest in all phases of the industry.

Canadian air mail for the period considered totaled 217,477 pounds, with the heaviest run being from Moncton, N. B., to Charlottetown, P. E. I., a winter schedule. Other heavy runs were the Quebec-Seven Islands and Quebec-Natashquan routes over which 53,000 pounds of mail were carried. A total of 973 trips were scheduled, and 173,141 miles flown during the three months.

There were 354 private pilots, 383 commercial pilots and 412 engineers licensed as well as 300 commercial planes and 98 air harbors.

Among the commercial operators flying air mail routes, Canadian Airways' Eastern Division, in addition to mail, carried 937 pounds of express and 420 passengers. National Air Transport, Ltd., carried 878 pounds of express and 48 passengers, and General Airways, Ltd., carried 5961 pounds of express and 440 passengers.

The Light Airplane Club of Canada, government sponsored, inaugurated its seventh year of operation this winter, and for the first three months of 1934 showed a membership of 1809 in 23 clubs. Sixty-six planes were being used by 364 members under instruction; 1097 hours were flown and 19 private as well as 12 commercial pilot licenses were issued during that time.

ON JULY 1, Vancouver and other British Columbia points were placed in direct airline contact with virtually every major city in the United States when United Air Lines opened direct daily passenger-express schedules into Canada. One daily round-trip is being flown in Boeing 247 transports which maintain a 55-minute schedule between Seattle and Vancouver. United has established offices in the administration building at the Sea Island airport and at the Georgia Hotel.

Great Britain

MORE THAN 250,000 persons gathered at Hendon, England, to witness the annual Royal Air Force display and watch the Prince of Wales fly his own plane into the airport and make a perfect landing on the field.

This year there were fifteen planes and one autogiro in the New Type Aircraft Park, some of them outstanding military types. In addition there was also displayed a number of new engines, parts and accessories.

Among the new-type military craft was the Hawker High-speed *Fury,* powered by a Rolls-Royce *Goshawk* engine. It is an interceptor fighter and is reported to have a speed of 250 m.p.h. Other interesting military types were the Supermarine day and night fighter, a Westland fighter, Hawker Day-Bomber, Hawker *Hart,* Bristol fighter, Houston-Westland PV 3, Westland general purpose bomber and torpedo carrier, Armstrong Whitworth general purpose biplane, Blackburn B6 torpedo-spotter-reconnaissance shipplane, the Fairey general purpose biplane and the Boulton and Paul *Overstrand,* twin-engined bomber. The Handley-Page *Heyford* Night Bomber and the new wingless type autogiro also aroused considerable comment. In the commercial exhibit, forty-seven firms exhibited their products.

JERSEY AIRWAYS, Ltd., has inaugurated service between London and Jersey, lowering the time (by boat) between the two cities by nine hours.

One round-trip will be made during the early stages of the service, but this will be increased later on. Fares are slightly higher than the cost of a first-class train and steamer ticket, but the service already has been well patronized in the short time it is operating.

AN EXCLUSIVE air express service was established between Manchester and London by a Manchester firm of transport operators who are flying 160 mile-an-hour freighters capable of carrying one ton of payload. Daily flights are made on a three-hour schedule and it is proposed to extend K. L. M.'s Amsterdam-Hull service to Manchester for a possible tie-up.

(Continued on following page)

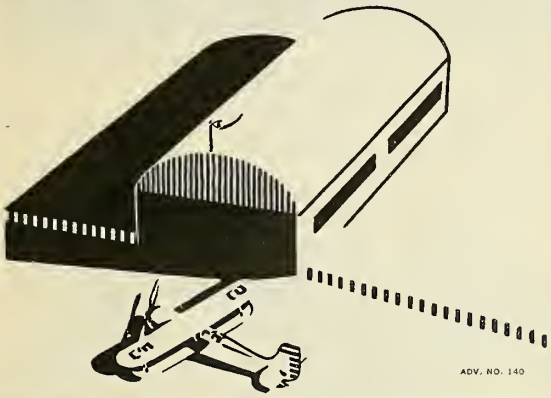
P. & W. Wasp-powered MWT-1 designed by Dr. Michael Watter and built in Mexico for long-range flight

MACWHYTE TIE RODS

● To insure continued satisfactory service for your tie rods, Macwhyte offers a complete inspection, proof-loading and reconditioning service at nominal charge.

Standard equipment on most of America's aircraft

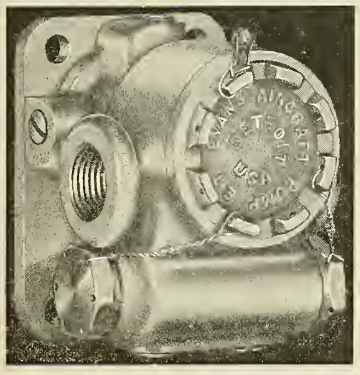
⬬ Streamline ■ Square ● Round



Macwhyte Company · Kenosha, Wisconsin

Manufacturers of Tie Rods · Cable · Slings · For Aircraft

When Reliability is Needed



Use the

Evans E-7 Aircraft Fuel Pump

THE hazard of gasoline leakage is positively eliminated by a spring-loaded flexible sylphon seal. A flexible shaft entirely overcomes the possibility of shaft breakage which has always been one of the principal causes of pump failure. No other aircraft fuel pump has these two advantages. Integral relief valve and wabble pump bypass permit more simple and compact installation. Primes at speeds as low as 50 r.p.m. and provides fuel at constant pressure regardless of variations in fuel consumption.

These are only a few of the features; write for complete specifications that show why E-7 is far superior to other aircraft fuel pumps.

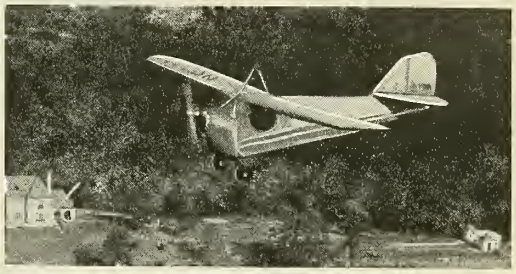
THE EVANS APPLIANCE COMPANY

253 Vinewood Ave., Detroit, Michigan

90 West Street, New York — 1142 Howard St., San Francisco

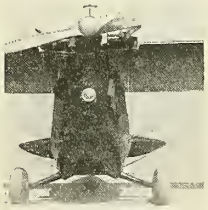
An INCOME Builder

for Commercial Operators.. Schools.. Private Owners!

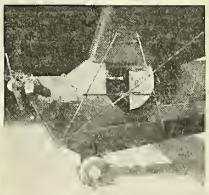


The IMPROVED AERONCA

SCHOOLS *appreciate Aeronca's unusual side-by-side dual control arrangement—stability in the air—ruggedness—and extremely low operating cost.*



PRIVATE OWNERS *know the Aeronca Engine is dependable and powerful—that it will take them where they want to go. They like Aeronca's new streamlining and single-strut landing gear, too.*



COMMERCIAL OPERATORS *are won by the ease with which their passengers enter the Aeronca cockpit; by Aeronca's ability to stand up under passenger flying or cross-country punishment; by the excellent visibility for photography.*

Here's one of the few airplanes in the "pleasure-ship" class that's really an income-builder for its owner. That's the main reason orders are pouring in — HAVE BEEN pouring in, even before aviation in general started its climb to recovery.

In continuous production since early 1930, Aeronca has proved itself a practical, dependable ship in the only way that these qualities CAN be proved—by an unbroken performance record at amazingly low operating cost. Aeronca is easy and cheap to overhaul. It is built with its owner in mind; not for the luxury-lover, but for the operator who wants to service it himself and operate it at a profit.

These mechanical qualities of Aeronca are important. Equally important to the commercial operator are the qualities that make Aeronca performance so outstanding—its remarkable climb—its ease of control—its really "hands-off" stability in almost any air conditions.

The statement that Aeronca is unchallenged under $2000, for complete satisfaction in instruction, commercial or pleasure flying, has often been made. There are two ways for you to prove this statement to yourself; inspect and test the Aeronca at your nearest dealer, or write for the descriptive booklet, "Flying in Its Safest and Most Economical Form."

AERONCA

AERONAUTICAL CORPORATION of AMERICA

LUNKEN AIRPORT • **CINCINNATI, OHIO**

(*Continued from preceding page*)

Germany

DEUTSCHE SCHIFF und Maschinenbau A. G. (Deschimag) of Bremen has formed a subsidiary company known as the Weser-Flugzeugbau for the construction of aircraft. This is the third German industry which has turned to the building of planes.

THE AIRPORTS at Koenigsberg, Munich and Frankfort will shortly be equipped with radio landing beacons, following the successful termination of tests of the installation by Deutsche Luft Hansa. Most of the commercial pilots have been instructed in the use of the new equipment which replaces the "ZZ" system used up to the present. Perfection of this system, made possible by adding a supplementary beacon indicating the angle of descent as an aid in blind landings, is expected to come within a year.

DERULUFT, the Russian-German airline, reports a 179 per cent increase in passenger traffic to Leningrad and a 118 per cent increase to Moscow for May, 1934, compared with the same month last year. The volume of air mail and express carried also increased by more than 100 per cent.

AIR LAWS in Germany have been modified so that full control over all air navigation now is in the hands of the National Government and such authority which formerly rested in the states is now held by the central authority. The law provides, among other things, for the strict control of aerial photography and calls upon the states to place their aviation officials at the service of the Reich, when necessary.

Italy

ON THE recommendation of the president of the Royal Italian Aero Club, Premier Mussolini has appointed Comdt. Eugenio Gandolfi as temporary General Secretary of the Club, a position which has been vacant since the former secretary left a year ago.

GENERAL VALLE, Under-Secretary of Air, inspected the military air forces stationed at Bresso, Milan; Lonato Pozzolo, Gallarata; and the bombing school at Malpensa, Milan. He also visited the Savoia Marchetti factory at Sesto Calende and at the Cameri airport he witnessed experimental flights of new-type military aircraft.

RECENT TESTS of a Breda 27 single-seater fighter indicated that the plane has a high speed of more than 225 miles an hour. Piloted by Ildebrando Artigiani, the plane was flown between Milan and Rome, a distance of about 315 miles, in 1 hour 21 minutes, flying a good part of the way at more than 16,500 feet. Artigiani clipped 9 minutes off the old record for a flight between these cities.

Hans Schaller, Berlin

German sport planes assembled at Templehof before starting the 1934 Deutschlandflug

Norway

THE OSLO-COPENHAGEN summer service operated by Deutsche Luft Hansa is now flying with Ju-52 Hornet-powered tri-motored seaplanes carrying 16 passengers. At Copenhagen, passengers for British and continental points are transferred to land planes. During the first ten days of the service, traffic increased four times over that carried last year for the same period.

LIEUT. WIDEROE, a young Norwegian officer has made a number of successful flights in his Waco cabin plane carrying passengers from Oslo to the mountains for winter sports. In order to operate more efficiently, the pilot has equipped his plane with skiis.

Poland

AN INTERESTING feature of the 1934 Challenge de Tourisme International which will be held in Warsaw, Poland, from September 7-16 will be the participation of foreign aircraft powered by American engines. Twelve Menasco B6S engines are to be in the 6000-mile tour, the winner of which will be judged on a formula covering speed and efficiency. Foreign companies purchasing Menasco engines for planes in the tour are the Polish manufacturers Panstwaine Zaklady Lotnicze (P. Z. L.), which bought six; Sikcja Lotnicza Studentow Politechnike (R. W. D.), which took three (B6) and the German manufacturer, Bayerische Fleugzeugwerke, A. G. (B. F. W.), which also took three.

The meet will be held in three groups: the first from August 28 to September 7, will be for the technical trials; the second, from September 8 to September 15, for the circuit of Europe, and the last on September 16, when the speed events will be run off.

South America

THREE CURTISS Kingbirds of the SACO Airlines of Colombia arrived at Bogota on June 23rd, completing a 4200-mile flight from Atlanta, Georgia, a trip which, it is believed, established a new distance record for a massed flight of commercial airplanes. The Kingbirds were purchased from Eastern Air Lines by Ernesto Samper, technical director of the SACO Airlines based in Bogota, and are to be used to augment their established passenger and express service between the principal cities of the country.

Besides Samper, personnel of the flight included Dan Hughes, Jr., G. V. Patterson, Jr., J. S. B. Harvey, E. F. Weast, W. C. McDonald and Mr. and Mrs. Floyd Addison.

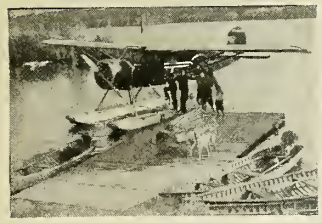
A DECREE of the Brazilian government has authorized a contract with Condor Syndicate for the operation of a weekly service. The proposed route is to be along the railroad between Sao Paulo and Corumba and along the national telegraph lines and stretches of the Paraguay, San Laurenco and Cuyaba rivers. The total mileage is approximately 1,160 and twelve cities will be served.

ACCORDING TO the terms of a contract signed by the Brazilian government and Cia. Nacional de Construccoes Civis e Hydraulicas, an airport at Rio de Janeiro will be completed by September, 1935. It will be prepared on land known as Ponta de Calabouco and at an estimated cost of about $850,000.

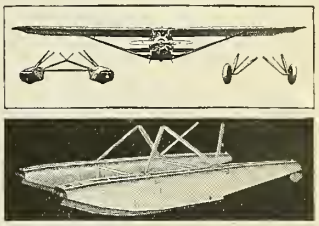
ENGINEERING students, who complete courses in aerodynamics, meteorology, navigation, theory of flight, engineering, etc., will be awarded an Aeronautical Engineer degree by the University of Cordoba, Argentina. Although these courses have been given for some time, this is the initial instance that so much emphasis has been given them.

EDO FLOATS

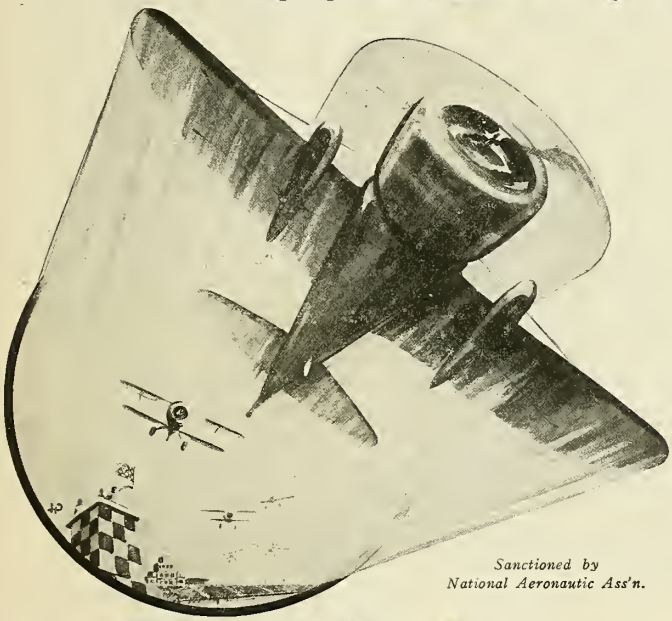
YOU'LL ENJOY FLYING OVER THE WATER—ON EDO FLOATS



Equip your favorite ship with EDO Floats. Cruise the coast from Cape Cod to the Chesapeake. Explore hidden lakes in the north woods, palm-fringed bayous in the southland. Hop to Nassau or skirt the Gulf. Commute, if you wish, direct to lake and shore resorts. Seaplanes are faster—safer—more easily handled. Write for cost of equipping your ship with EDO Floats, interchangeable with wheel landing gear. Address, EDO AIRCRAFT CORPORATION, 610 Second Street, College Point, Long Island, N. Y.



1934 NATIONAL AIR RACES



Sanctioned by National Aeronautic Ass'n.

TEN DAYS INTO FOUR

Aug. 31-Sept. 1-2-3
CLEVELAND

Again Cleveland furnishes the setting for the National Air Races. Again—this world's premier sports classic will serve as the rendezvous of the industry.

A ten day program concentrated into four days of intense activity, presenting—more gruelling competitions—more numerous innovations—and a greater concentration of the newest creations in racing craft ever before seen.

This year's classic will be the most pretentious ever staged. The program includes Free-for-All competitions in all cubic inch motor classifications—and demonstrations of every phase of aviation. Land Plane Speed Classics—Massed Flights—Foreign Flying Aces—Night Spectacles—Autogiro, Blimp and Parachute Jumping contests, etc. $35,000 cash prizes and valuable trophies will be awarded.

Here, new world's land plane speed records are destined to be shattered. Here, the industry will again receive inspiration for future progress and development. Everybody in Aviation will be in attendance.

For information and details write, Clifford W. and Phillip T. Henderson, Managing Directors, National Air Races, 103 Terminal Tower Arcade, Cleveland, Ohio.

AVIATION'S MOST COLORFUL SPORTS CLASSIC

Johnson Approved Log Books

ARE THE BEST MADE — STANDARD SINCE 1919

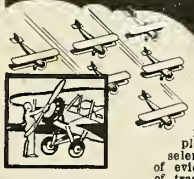
For Pilot, Engine and Aircraft

No. 12 PILOT, with black genuine leather cover	$.75
With your name in gold letters	1.00
INSERT TYPE, with heavy paper cover, size 3½" x 6": Pilot $.30 Engine $.20 Aircraft	.30
Red leatherette binder to fit Insert Logs	.60
Brown leatherette waterproof bag	.40
Complete set Insert Type log books, with binder and bag	1.40
NC TYPE, with hard back covers, size 5" x 6½": Pilot $.60 Engine $.65 Aircraft	.85
AIRPORT REGISTER, size 11½" x 15", loose leaf type with 50 pages of approved forms, with name of your airport in gold letters	5.20

Insist on getting Johnson Log Books. If your dealer doesn't carry them, send your order direct to us.

JOHNSON AIRPLANE & SUPPLY CO.
445-449 East First Street — Dayton, Ohio

Your Future AVIATION Career Should Pay Rich Dividends



Government Approved
This school is Government Approved, backed by twenty-four years' successful experience as a mechanics trade school . . . fourteen years teaching aviation. We can now offer to a limited number of men part time employment. Act now!

Providing You Train at
LINCOLN Now!

In choosing your future career consider what aviation offers you. Airline pilots earn $500 per month on an average, airplane and engine mechanics and operators also earn good salaries. It does not take a prophet to forecast what the future of aviation will be. It is the world's newest and swiftest means of transportation.

New Jobs—The U. S. Government is now spending millions of dollars to make America FIRST IN THE AIR. This will mean thousands of new jobs for men who are properly trained, as Lincoln trains them.

MODERN EQUIPMENT—HIGHEST TYPE TRAINING

Here at Lincoln we train you for government license as Transport, Limited Commercial, Private or Amateur Pilot. Only modern high class training planes with Dept. of Commerce approval are used. Highest type pilot instructors. Both flight and ground training **Under Government Supervision.** Thoroughly equipped ground and mechanics school with high class, experienced instructors qualify you as Master Airplane and Engine Mechanic. Write now. State your age.

LINCOLN AIRPLANE & FLYING SCHOOL, 303D Aircraft Bldg., Lincoln, Nebr

DIESEL HANDBOOK

By J. Rosbloom

• IN CREATING this text the author had in mind the simplification of the study of Diesel engineering, but the work still maintains its value as a standard guide for Diesel instruction. As an aid in clarifying problems often encountered in service, the text is written in the convenient method of questions and answers and carries the endorsement of the United Licensed Officers, U.S.A.

The contents are divided into two parts, Part I containing ten treatises. Part II contains twelve sections, the last of which, "Points to Remember," should be of great use to the engineer. Exceptional care is evidenced in the numerous line drawings and problems while a complete mastery of the subject is indicated in the clear and well-defined answers to the questions. Special formulas for diametral and circular pitch and tables giving the gallonage of many sized tanks are instructive. In addition, the text is profusely illustrated with many clear and enlightening photographs.

A most careful study has been made by the author to meet the requirements in service, whether it be land, marine, aviation or portable installations.

Diesel Engineering Institute, Jersey City, N. J., are the publishers.

METAL AIRCRAFT CONSTRUCTION

By M. Langley

• A REVIEW for aeronautical engineers of the modern international practice in metal construction of aircraft. Intended for the junior draftsman, this second and enlarged edition of the book is in the nature of a text, but does not overlap any of the outstanding works on the subject, except in minor and necessary cases.

The author feels, and quite correctly so, that metal construction is now obviously past the stage where it requires advocacy. It is established and must stand on its own merits. Therefore, he presents only a statement of the methods used in England and other countries and adds notes which may be helpful in understanding the reasons underlying such different lines of development.

Divided into ten chapters, the book is profusely illustrated. The chapter on the history of the development of metal aircraft is especially instructive and interesting, providing the reader with the reasons for the change from wood to metal, the limitations and advantages of the former and the influence of metal in design. A chapter on corrosion, another on riveting and the tables of specifications and strengths of materials should be found especially informative.

Without becoming extremely technical, the author manages to provide a clear and intelligent report of a somewhat interesting and difficult topic. Published by Sir Isaac Pitman & Sons, Ltd., the book can be obtained from the Pitman Publishing Corp., New York, N. Y.

NAVIGATION AND NAUTICAL ASTRONOMY

By Capt. Benjamin Dutton

• THE FIFTH edition of this famous work has just been published by the U. S. Naval Institute where it has been used as a standard textbook for almost ten years. This in itself should stamp the tome as outstanding in its class, but it has other qualifications which make it particularly helpful and instructive.

Navigation and pilotage, as applied to the safe conduct of a vessel at sea and in sight of land, are both applicable in principle to similar work in aircraft, except that it is conceded the flier has more difficulties to overcome. These are explained in a chapter on Aerial Navigation which includes sub-chapters on dead reckoning, operations from a moving base, examples of scouting and patrol problems, as well as descriptions and illustrations of the drift indicator and computer, earth inductor compass, instruments and aerial celestial navigation.

Aside from the chapter on aerial navigation, there are twenty-one other chapters, all well-written and profusely illustrated. A text such as this should be extremely helpful to all airmen in furthering their knowledge of navigation. The price from the Naval Institute is $3.75 per copy.

MECHANICS OF FLIGHT

By A. C. Kermode

• THIS IS the second edition of this work and the first volume of a series intended for those who are engaged in practical aeronautical engineering. The other volumes, each by J. D. Haddon are *Structures* and *Properties and Strengths of Materials.* The entire series is published by Isaac Pitman & Son, Ltd.

In the *Mechanics of Flight,* which outlines the principles which maintain a plane in flight, the author has attempted to adopt most of the suggestions offered by critics of the first edition and has made a considerable number of detail alterations, all tending to clarify and make easier an understanding of the subject matter under discussion. Particularly significant is the avoidance of the use of anything but simple mathematics, mechanics and trigonometry.

ALTITUDE AND AZIMUTH TABLES FOR AIR AND SEA NAVIGATION

• AS IN all such tables, the objective has been to enable the navigator to find the position of his ship quickly and accurately, without the usual logarithmic procedure. Through elimination of interpolation, the I. C. S. Tables are specially adapted for rapid work—an essential feature in establishing position while flying.

Examples of various sights are given, explaining each step taken in using the tables to find the ship's position from observations of the sun, stars, or moon. The tables are intended only for the use of trained navigators, and an understanding of astronomical navigation is necessary for their use. Printed in clear, readable type, they cover only 91 pages in comparison with the more than 200 pages covered by similar tables in the past. Their compactness adds to their value as a part of the navigating outfit of aircraft.

Arrangement of the tables was designed by E. B. Collins, Senior Scientist, United States Hydrographic Office, in collaboration with Captain E. K. Roden, Director, School of Navigation, International Correspondence Schools. The International Textbook Co., Scranton, Pa., are the publishers.

AERODYNAMIC THEORY

By William F. Durand

• A COMPLETE work by the world's leading authorities in aerodynamics and a scientific foundation of practical aviation providing the student and designer a presentation of background theory.

Volume I of a series of six, containing the efforts of such authorities as Mr. Durand, Dr. Max M. Munk, R. Giacomelli and E. Pistolesi, contains divisions of Mathematical Aids, Fluid Mechanics and a historical sketch of flight. The latter section is divided into three parts, each discussing aerodynamics and its development, and takes the reader through the period from antiquity to 1687 when Newton's Principia was published, to 1894 when Lanchester read his famous paper, "Stability of an Aerodrome" (airplane) before the Birmingham Natural History and Philosophical Society, down to the present day.

This first volume is largely taken up with material dealing with special mathematical topics and with fluid mechanics. It is very well divided and subdivided into divisions, chapters, and subchapters and those drawings that are presented therein are done in clear and careful style. More than 150 illustrations, numerous tables and 400 pages of text help make this volume one of the outstanding works on the topics covered.

ADVERTISERS' LITERATURE

THIS service is for the convenience of those who are in the market for any of the products or facilities advertised in this issue. Read carefully the advertising of the items in which you are interested, to determine whether the information offered is what you need. When filling out the coupon be sure to mention the company with which you are associated, and your position.

AIRCRAFT

1. Dealers, pilots, etc., are invited to write for literature describing the Aeronca—two-place light plane.....Page 77

2. Dealers, operators, potential plane owners, get a copy of the Beech catalog which describes the complete line of high performance Beechcraft. Page 51

3. Bellanca literature—for airline and commercial operators, dealers, pilots, etc., tells an interesting story of dependability .....Page 33

4. American and foreign airline executives are requested to write for data concerning the Boeing "247".....Page 29

5. The C-W "Condor" dayplane and sleeper-plane are described in the C-W catalog, for executives of American and foreign airlines. 2d Cover

6. Military officials and airline operators should have a copy of the Consolidated aircraft literature .....Page 2

7. The Douglas Airliner booklet belongs in the files of every airline official in this country and abroad....Page 4

8. Pilots, plane owners, dealers: let the Lambert Aircraft Corp. send you their latest literature describing the new Monocoupe models....Page 75

9. Prospective buyers of light airplanes, and dealers, are invited to write for Taylor Aircraft literature.....Page 71

10. For military officials in this and foreign countries, a copy of the Vought "Corsair" booklet is available....Page 41

11. For dealers, commercial operators and those contemplating the purchase of a plane, the Waco catalog describes that company's new open and closed models. Page 73

ENGINES

12. The Wright "Cyclone" booklet will be sent promptly, on request, to engineers and executives of aircraft manufacturing and operating organizations, as well as to military officials.....Page 35

13. Engineers, manufacturers, operators, Army and Navy Air Corps authorities—write for a copy of the Pratt & Whitney catalog.....Back Cover

AIRCRAFT AND ENGINE EQUIPMENT

14. For manufacturers, repair stations, schools, etc., the Berry Bros. aircraft finishing literature is helpful Page 75

15. The B. G. spark plug literature is available to everyone who flies, owns or services aircraft .....Page 7

16. Engineers, prodnction men and others seeking to cut assembly and servicing time should obtain a copy of the new Dzus Fastener catalog, available Sept. 1.....Page 59

17. Aircraft and engine designers, operators, pilots, etc.—write for the Evans Fuel Pump literature.....Page 77

18. Users of shot-welded stainless steel construction should have the technical data made available by Fleetwings, Inc. .....Page 51

19. Operators, owners, manufacturers—send for copy of the Goodrich literature...Page 31

20. A Goodyear tire booklet will be sent to all nsers of aircraft tires .....Page 23

21. Hamilton Standard Controllable Pitch Propeller data will be sent, on request, to all aircraft engineers, operators and owners .....Page 25

22. Pilots, aircraft operators, manufacturers, dealers, etc., write for a copy of the H-T spark plug booklet....Page 80

23. Technical data—for aircraft engineers and manufacturers—is available, describing Hazard Korodless Aircraft Cable for engine and flying controls .....Page 57

24. Precision aircraft instruments, by Kollsman, are described in a catalog for engineers, mannfacturers, operators, pilots and dealers..Page 1

25. For tie rod information, write for the MacWhyte booklet of square, round and streamline shapes.....Page 77

26. Norma-Hoffmann precision aircraft bearings are described technically for aeronautical engineers, designers and mannfacturers....Page 57

27. Users of aircraft instruments, dealer organizations, etc., let Pioneer send you their complete catalog .....Page 37

28. Airline executives, military officials, pilots — you should have a copy of the booklet describing the Sperry Automatic Pilot and Directional Gyro .....Page 57

29. Engine designers, mannfacturers, service stations; aircraft operators, pilots—write for the Thompson Valve literature .....Third Cover

30. For those who are concerned with design, manufacture and servicing of aircraft engines; for dealers, etc.—the Vellumoid Gasket literature will prove helpful.....Page 51

31. If you are about to pnrchase aircraft covering fabric, let Wellington Sears send you their specifications and other technical data.....Page 73

32. Ready to buy leak-proof, quick installing hose clamps? Get a copy of the Wittek literature .....Page 75

MISCELLANEOUS

33. For portable and durable airport buildings and shops, for culverts, etc., write for the American Sheet & Tin Plate Co. booklet .....Page 73

34. "The Aeronaut," AC or DC superheterodyne receiver, is described for potential purchasers .....Page 53

35. Pilot, engine and aircraft log books, as well as other miscellaneous areonautical supplies, are offered by the Johnson company.....Page 79

36. Nicholas-Beazley, with one of the most complete stocks of aeronautical supplies in the country, requests pilots, operators and manufacturers to write for their catalog..Page 31

37. See the National Air Race advertisement for details of the 1934 Races. Contestants, write for detailed information. .....Page 79

38. The Westport aircraft radio receiver literature is available from Pacific Airmotive Corp. .....Page 69

39. Students, pilots, engineers, mechanics, etc., expand your technical knowledge through the Ronald Press library of aeronautical books. Write for catalog and price list..Page 88

40. R C A Victor aircraft radios are described and illustrated for airline and smaller commercial operators, private fliers, etc. .....Page 5

SCHOOLS

41. The Boeing School of Aeronautics' curriculum of flight and ground courses will be sent to prospective school students, on request..Page 47

42. Dallas Aviation School's tuition and details of courses are outlined in the latest D. A. S. catalog.....Page 6

43. For mechanics or aeronautical engineering training, write to the Casey Jones School of Aeronautics, recently moved into new and larger quarters. .....Page 71

44. The Lincoln School, Lincoln, Nebraska, invites prospective pilots and mechanics to write for their newest literature .....Page 79

45. "Skyward Ho!", Parks Air College's complete catalog, describes in detail flight and ground training.....Page 3

46. Training at San Diego, with its advantages, are described for pilots- and mechanics-to-be in the Ryan School literature .....Page 9

47. Roosevelt Aviation School, at Roosevelt Field, offers complete training for all classes of pilot and mechanic licenses .....Page 65

48. The Spartan School of Aeronautics' new catalog explains "3 Star" training, the "Dawn Patrol" and other phases of their aviation school work .....Page 39

49. Safair, operating their school at Roosevelt Field, requests future pilots and mechanics to obtain, free, their newest catalog on training, tuition, etc. .....Page 75

50. Tri-State College, established more than 50 years ago, offers complete courses in aero. engineering. Page 84

51. A catalog describing the Stewart one-year Master Mechanics Course is ready for mailing .....Page 73

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number

CHECK HERE: Name .....

No. ..... Position .....

No. ..... Company .....

No. ..... Address .....

No. ..... City and State.....

8-34

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

AIRPLANES FOR SALE

AVAILABLE FOR IMMEDIATE DELIVERY

23 Lycoming Stinson Trimotors	Big Spring, Cleveland, Tulsa, Dallas, Fort Worth, Nashville, Memphis, Chicago, Detroit, Albany	$4,500 to $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit	8,500
4 Wright Cyclone R 1820 E Pilgrims	Chicago, Cleveland, Albany	8,500
2 Wright J-6-9 Bellanca Peacemakers	Cleveland	4,000
2 Wright J-6-9 Stinson SM1-O	Cleveland	2,500
3 Wright J-6-9 Stearman 4CM1	Fort Worth, Cleveland, St. Louis	5,000
5 Wright J-5 Quals Stearman C3-MB	Glendale, Cleveland, Fort Worth, Newark, Dallas	1,500

THIS AIRCRAFT is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.

CASH OFFERS are requested to include newly overhauled engines installed and "NC" License.

In the event of export, all such shipments of aircraft will be covered by Export Airworthiness Certificates.

UPON REQUEST we will quote C.I.F. any desired Seaport or O.O.F. where now located.

Photographs to responsible buyers.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED

AMERICAN AIRWAYS, Inc., Sales Div., Municipal Airport, Cleveland, Ohio

Branch Office—Sales Division, 45 Vanderbilt Ave., New York City.

For Sale: Certified Used Ships

All ships licensed. Excellent condition. Trade or terms to responsible parties.

WACO SALES

OF NEW YORK, INC.

Hangar 16, Roosevelt Field, Mineola, N. Y.

N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

Detroit Aero Motors Co.

14019 Hamilton Ave., Highland Park, Mich.

FOR SALE—AIRCRAFT ENGINES: Velie, 65 h.p., $150; Warners, 110 h.p., $300; Continentals A70-1, 165 h.p., $350; Continentals A70-2, 165 h.p., $450; Wright J-5's, 220 h.p., $300; Wright J6-5's, 165 h.p., $350; Lycoming R-680, 210 h.p., $450. All above motors just been reconditioned.

WE BUY AND SELL AIRCRAFT ENGINES

Write for lowest prices on Stondord dope ond fobric.

WANTED

THE Aviation Section of Tbe Franklin Institute Museum has just completed rebuilding a Model B Wright Brothers airplane. In order to stimulate public interest it is planned, prior to placing the sbip on display, to taxi it around an airport, photograph it alongside modern transport ships, and perbaps allow a pilot who formerly owned a duplicate to attempt a short, straightaway bop. Tbe Museum bas on loan a Wright Brotbera engine of the correct type, but as this is the property of the Navy Department it cannot, under tbe law, be operated. Anyone knowing of tbe whereabouts of a Wright Brothers four-cylinder engine of the type used in 1911 and 1912, wbich could be borrowed or purchased for a moderate sum and presented to the Museum by a group interested in tbis work, is requested to communicate witb tbe Aviation Section of Tbe Franklin Institute Museum, Twentieth Street and the Parkway, Philadelphia, Pa. Unless badly broken up, condition of the engine is not important, as facilities are available to put it in first class shape.

ENGINE BROKERS

Hangar "B," Roosevelt Field, Mineola, N. Y.

FOR SALE OR EXCHANGE

The following engines, completely overhauled: Wright Whirlwinds—5, 7 and 9 cylinders—Types A-O; Continental 165's; Wasp "B's"; Challengers. Also a large selection of Eclipse starters and generators. Parts and accessories bought and sold.

DON WALLING W. W. WIELAND

THREE REAL BUYS

TRAVEL AIR E-4000: J-8 175; perfect condition, just recovered, all wires & struts chromium plated; beautiful high gloss finish, $1,350—STINSON JUNIOR: J-5; complete night flying equipment. Licensed to July 1935. A real bargain at $1,250—WACO 10: OXX-8; Millerized, licensed, steel prop, extra center section gas tank. Only $375.

LOUISVILLE FLYING SERVICE, INC.

Bowman Field Louisville, Ky.

AERO BROKERAGE SERVICE COMPANY

E. L. ERICKSON

LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA

"Selling the World Over"

Complete stock of parts for J-6 PITCAIRN AUTOGIRO and SIKORSKY S-39 AMPHIBION.

Write for NEW PRICE LIST on airplanes, motors, parts.

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale

The Vimalert Company, Ltd.

835 Garfield Avenue, Jersey City, N. J.

SUBSCRIBERS

WHEN moving, please send your new address—*together with the old*—as soon as possible. Your attention to this detail will guarantee prompt receipt of your copies. Address the Circulation Department, AERO DIGEST, 515 Madison Avenue, New York.

ENGINES

PARTS AND ACCESSORIES BOUGHT—SOLD

Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasco, etc. Also starters, generators, propellers, instruments, wheels and parachutes.

WRITE FOR PRICE LIST FRANK AMBROSE

AERO SALVAGE CO.

Glenn Curtiss Airport, Jackson Heights, N. Y.

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

STAINLESS STEEL TIPPED PROPELLERS

FLOTTORP PROPELLER CO.

1836 Linden Ave., S.E.

Grand Rapids, Michigan

PARTS

NEW AND USED

60% to 80% Off

Write for complete list

AIRPLANE PARTS AND SUPPLIES, INC.

1416 N. San Fernando Rd., Glendale, Calif.

FOR SALE

MISCELLANEOUS

51 Airplanes
20 Engines
Lights—landing, navigation
Fuel Pumps
Generators G1-G2
Oil and Fuel Line Fittings
Oil Reclaimers
Safes
Parachutes
Instruments
Starters and Parts
Propellers and Parts
Plywood (3-Ply Birch)
Aircraft Cable
Radio Receivers
Radio Parts R.C.A., W.E., S.C.
Paint, Varnish, Lacquer, dopes, etc.
Tools and Shop Equipment

AIRPLANE PARTS

Stinson Parts—Medols "S" Jr., SM1-D, SM6-B, SM6000-B
Ford Airplane Parts—5 AT
Fokker Parts—S.U. and FIOA
Travel Air Parts—(Model 4000)
Stearman Parts—(C3B-C3MB-4CM1-LT1)
Pitcairn Parts—(PA5-6-7)
Fairchild Parts—(FC2-FC2W2-71)
Bellanca Pacemaker Parts
Pilgrim Parts—(100A and 100B)

ENGINE PARTS

Wright Engine Parts—J-6-5, 7, 9 and J-5 Cyclone E. Gipsy
P & W Engine Parts—Wasp B & C-Wasp Jr. Hornet A-A1-A2-B-B1-C
Kinner Engine Parts—K5-B5-C5
Ignition Harness—Shielded & Unshielded
Spark Plugs
Magnetos and Parts
Carburetors and Parts

This is not a complete list. Additional equipment is being constantly received. Descriptive price lists mailed immediately upon request covering class of stock in which you are interested. Reasonable prices. New engine parts 50% off list—used parts 80% off list.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED

Please order by part number where possible.

AMERICAN AIRWAYS, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

NEW & USED ENGINE PARTS
(Write for our discounts first)
Kinner . Warner . J-5 . J-6 . Velie . Cirrus . Szekely
COMPLETE AVIATION SUPPLIES
Flottorp wood props — steel blades and hubs — semi-air wheels — magnetos — carburetors — Pioneer Instruments — fabric and dope at discounts.
CAMDEN AIR SUPPLIES
6307 Westfield Ave. Camden, New Jersey

RIEKER BANK INDICATORS

Made to U. S. Air Service specifications
Descriptive circular sent on request.
RIEKER INSTRUMENT COMPANY
1919 Fairmount Avenue Philadelphia, Pa.

STREAMLINES
Cowlings and Wheel Pants
Metal Spinning, Sheet Metal Specialties
HILL AIRCRAFT STREAMLINERS CO.
814-16 Reedy St. Cincinnati, Ohio

UNIVERSAL PROPELLERS
APPROVED TYPES
Special price on few test props, $24.50; used K-5 Hartzell, OX-5 and Velie M-5.
All guaranteed in perfect condition.
UNIVERSAL AIRCRAFT SUPPLY CO.
2300 N. 9th Street St. Louis, Mo.

San Fernando & Raymond - - Glendale, Calif.
LIEUT. W.D. HAWKINS
AIR-PARTS 70-85% OFF
A DEPENDABLE COMPANY
All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velie, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

KEEP YOUR COPIES OF AERO DIGEST IN A BOUND VOLUME
Attractive and durable binding at special rates to AERO DIGEST subscribers
MANHATTAN BOOKBINDERY
240-242 W. 23rd St., New York, N. Y.
Phone CHelsea 3-7204

"INSTRUMENT FLYING"
By Howard Stark
80 pages. 25 illustrations. Flexible cover.
$2.00 postpaid.
A method of locating the radio beacon station.
James Stark, Pawling, N. Y.

PATENTS—TRADE MARKS
All inventions submitted held confidential and given personal attention by members of the firm.
Form "Evidence of Conception" and instructions
"How to Establish Your Rights"—Free
LANCASTER, ALLWINE & ROMMEL
PATENT LAW OFFICES
472 Bowen Bldg. Washington, D. C.

selected clear aero sitka
SPRUCE
For quick shipment from Chicago, rough or finished to exact size. For airplanes, pliders, iceboats, etc.
Lowest Wholesale Prices
Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.
Come to Us for Good Spruce
PIKE-DIAL LUMBER CO.
Airplane Lumber Specialists—2251 Loomis St., Chicago
We also carry "Plycor" aircraft plywood

USE BLUE-ROCK TITE-SEAL

Two kinds: Light-Weight and Fibre-Form. Never hardens. Big half-pound tube, only $1.00
SUPPLY DIVISION, INC., Robertson, Mo.

A FEW SPECIALS
Rieker Pitch & Bank Indicators, $5; Irving Parachute Harness, unused, $12; Scintilla Magneto Switches, each $4; Aeromarine Liberty Starters, new, $20; Wasp Main Crankcase, $150; J-5 Airmaze and Heater Assembly, new, $12; Carburetor, $25; Cylinders set (9), $100; Pistons, $2; Oil Pumps, $12; Fuel Pumps, $10.
Hornet, Cyclone, Kinner, Challenger, Eaglerock Parts, Instruments, Wheels, etc. *Let us quote.*
DYCER AIRPORT
9401 So. Western Avenue Los Angeles, Calif.

—SUPPLY BULLETIN ANNOUNCEMENT—
Within the next few weeks we will publish a special Bargain Bulletin of our complete stock of Aviation supplies. We want your name on our mailing list as soon as possible so that we will know how many copies to order from the printer. We will list a complete line of materials including instruments, propellers, dope, fabric, bolts & nuts, wheels, tires & engine parts. Send your name at once to:
CAMDEN AIR SUPPLIES
6307 Westfield Ave. Camden, N. J.

SELLING
THE PRIVATE FLIER

AIRCRAFT manufacturers are introducing new models . . . new aircraft companies are forming . . . some manufacturers are working three shifts a day in order to equalize production and sales. Most of them are manufacturers of two- and four-place planes, proving the growth of the private flying market.

It will pay manufacturers and dealers to make a special play for the private flier's attention. You can do it economically in THE SPORTSMAN PILOT, only magazine devoted 100% to the sportsman flier. Write for schedule of rates and other data concerning this lively publication.

THE SPORTSMAN PILOT
515 Madison Avenue, New York. N. Y.
Phone: PLaza 3-6969

Research Design Stress-Analysis — Gee Bee DESIGNED BY — Manufacturing Flight-Testing Operations
GRANVILLE, MILLER & DE LACKNER
CONSULTING
AERONAUTICAL ENGINEERS
SPRINGFIELD AIRPORT, SPRINGFIELD, MASS.

"FAY-EGAN"
ALUMINUM ALLOY PROPELLERS
For Engines from 200 to 800 h.p.
Approved by Department of Commerce
THE FAY-EGAN MFG. CO.
Cincinnati, Ohio

N. A. C. A. Cowling Specialists
METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter
MAGOSY & BUSCHER
120-126 Walker Street New York, N. Y.

Phenix Clear Nitrate Dopes
Clear — $1.05 per gal. in 50 gal. Drums included
— $1.10 per gal. in 30 gal. Drums included
— $1.20 per gal. in 5 gal. boxed cans
Pigmented—$1.90 per gal. in 5 gal. boxed cans
Yellow, Blue, Green, Cream, Khaki, Aluminum, Black, White. Immediate shipments fresh high grade.
"Send ½ the cost with C. O. D. shipments"
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

AERO BLUE BOOK
gives specifications of over 350 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Also present second-hand market value of popular ships. Only information of its kind ever compiled. Almost priceless to students, engineers, dealers and flyers. Complete, only. . . $1.00 postpaid.
NATIONAL DISTRIBUTORS,
922 Pine St., St. Louis, Mo.

A COMPLETE LINE
TITANINE
THE WORLD'S PREMIER
DOPE
TITANINE, INC.
MORRIS & ELMWOOD AVES.
Union, Union Co., N. J.

MAX M. MUNK
Registered Patent Attorney
Grad. Mech. Engineer
Doctor of Engineering
Ph.D.
Member Virginia Bar
Technical Author
Rendering professional service of highest standard to government and private parties here and abroad since 1915.
1734 Eye St., N. W. Washington, D. C.

Royal E. Burnham
Attorney-at-Law
Patent and Trade Mark Causes
511 Eleventh St., N.W., Washington, D.C.

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

AUTOGIRO, AIRPLANE
and ENGINE MECHANICS COURSE
taught under
GOVERNMENT LICENSED INSTRUCTORS
Complete Instructions on all types of
MODERN ENGINES and PLANES
Day and evening classes; easy terms if desired
For Information:
RISING SUN AIRCRAFT SCHOOL
"H" AND LUZERNE ST., PHILADELPHIA, PA.

Pacific School of Aviation
All Flight Instruction Under Personal Supervision of
LT. JIM GRANGER
at Clover Field — Santa Monica, California

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS
Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering.
NEW YORK UNIVERSITY
UNIVERSITY HEIGHTS, NEW YORK, N. Y.

AERONAUTICAL ENGINEERING
DEGREE IN 2 YEARS

Become an Aeronautical Engineer. Tri-State College course given in 108 weeks. Bachelor of Science degree. Graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Thorough training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Non-essentials eliminated. Courses designed to save student time and money. Flying school facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter September, January, March, June. Courses are offered also in Civil, Architectural, Electrical, Mechanical, Chemical, Radio Engineering; Business Administration and Accounting. Living costs and tuition low. Those who lack high school may make up work. World famous for technical 2-year courses. Graduates successful. Write for catalog.

1084 COLLEGE AVE., ANGOLA, IND.
TRI-STATE COLLEGE

FLYING SCHOOL
U. S. Department of Commerce Approved
INTER CITY AIRLINES, Inc.
BOSTON MUNICIPAL AIRPORT
EAST BOSTON, MASS.

AERONAUTICAL UNIVERSITY
Recommended by the Aviation industry. Approved by Aeronautics Branch, U. S. Dept. of Commerce. Est. in 1929 by Curtiss-Wright. Latest equipment.
Aeronautical Engineering (*Degree*)
Master Mechanics-Administrative
Pilot's Ground Courses
Reasonable tuition. Write for free Catalog A8
1338 S. MICHIGAN AVE., CHICAGO, ILL.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

FAIRCHILD 22: Cirrus Hi-Drive; total 325 hours, licensed, always waxed and hangared, excellent condition, extras. $1,375 cash or trade for Lambert or Warner Monocoupe. OX-5 Challenger, $650; OX-5 Travel Air, $575. Both excellent condition. Valley Airways, Inc., Winchester, Virginia.

J-5 STANDARD D-25: $2,200. Landing lights, flares. Late production ship and engine. Fabric excellent. Will consider trades. Dick Schall, Berwyn, Maryland. Telephone: Berwyn 70.

GIPSY low-wing sportster, monocoque fuselage, Haskelite wings. Top, 150; cruise 120. Took one first, second, third place Legion races, Menominee, Michigan. Less motor, $400. Arthur Jacobsen, 1314 So. 8th Avenue, Escanaba, Michigan.

OX-5 TRAVEL AIR: Licensed until June, 1935; silver wings, red fuselage; brakes; dual control; Scintilla magneto; Miller overhead; ten hours on motor since top overhaul. Always privately owned. Never cracked. First $500 cash accepted. Also completely overhauled spare motor, with Miller overhead, magneto; and used Paragon propeller, $100. Address Howard H. Greene, 74 Jerome Avenue, Bradford, Pennsylvania.

AERONCA two-place: NC 13002 fully equipped. 250 hours. Not a scratch; cannot distinguish from new ship. Always stored in private hangar; privately flown for pleasure only. Engine has had factory overhaul each 100 hours. Buying larger ship. AERO DIGEST, Box 1830.

SACRIFICE: Granville GeeBee SuperSportster No. 7: World's fastest land plane. Clocked at 330 m.p.h. at Springfield, Mass. Now equipped with latest Granville wing, allowing 260 gallons gas for transcontinental effort. Guaranteed performance with late Hornet engine with reduced landing speed. This ship will establish new transcontinental record before end of present year. Will sacrifice for limited time only. Communicate with E. Morgan Voelker, 629 North Olsen Street, Tucson, Arizona.

BUHL BULL PUP: Szekely 45; 145 hours total, 6 hours since complete airplane and engine overhaul; new covering. Never cracked; licensed until November 15th. Best cash offer. Alfred Sauter, 30 Clifton St., West Haven, Connecticut.

J-5 WACO TAPERWING: New motor, tires, covering; etched prop. Exceptionally good condition. $1,500 or trade on Waco F. John V. Kipp, Cannon Falls, Minnesota.

FOR SALE: Barling NB-3. Just recovered, refinished and relicensed. New prop and airwheels. Two hours since motor overhaul. Price $550. Vaughn McIntire, 1001 So. 23 St., Fort Dodge, Iowa.

VELIE MONOCOUPE: Motor 25 hours since overhaul; recovered last fall; identified. $350 cash. Would consider trade on Great Lakes or Lamhert Monocoupe. M. L. Terry, Box 23, LaPorte City, Iowa.

LAMBERT CAVALIER: 2-place cabin. Low hours; ship and motor in perfect condition. Sell at hargain, cash, or exchange on J-5 joh. Harley Miethe, Georgetown, Illinois.

PRIVATEER AMPHIBION: Two-place, excellent condition; hank and turn, rate of climh, compass, thermocouple, Heywood starter; less than 300 hours. Licensed June, 1935. Frank Mills, Essington, Pennsylania.

REAL BUY: Fairchild 24; 125 Warner. Ship new November 1933. Privately owned. Seen at North Beach; $2,900. Andrew Warwick, 3531-89th St., Jackson Heights, New York.

WACO F: 5 hours since overhaul; special paint joh; removahle front cockpit cover; special instruments; special rear windshield; just relicensed. J. Melton, Victory Theatre, Denver, Colorado.

BEST CASH offer takes two-place, 100 Kinner Savoia Marchetti; just overhauled, relicensed. 157 hours total. E. R. Fenimore, 400 Gillet Building, Baltimore, Maryland.

FOR SALE: OX-5 longwing Eaglerock with new toothpick prop; good tires and wheels; covering needs some repair. Make an offer. John C. Gilhert, Onekama, Michigan.

CHALLENGER BIPLANE: OX-5; less than 300 hours. Extras. Sacrifice, $475. Capitol Airport, Bladensburg, Maryland.

CURTISS JUNIOR: 45 b.p.; new type Szekely cylinders. 10 hours since complete overhaul. $450. Alexander Loeh, 230 West 99th Street, New York City. Riverside 9-6547.

FOR SALE: Travel Air 4000 hiplane, new Kinner K5 motor. Dual controls. Navigation lights. Instruments in hoth cockpits. Compass, airspeed, turn and bank, rate of climh, pitch indicator. Ship in wonderful condition. A wonder for student instruction. J. Hagan, 377 North Pearl St. Alhany, N. Y.

TRAVEL AIR OX: Recently refinished; looks like new, flies the same. Bargain, $450. Instruction. Aeromarine Klemm: Refinished, looks like new. A steal at $450. Instruction. Jos. Simcock, 200 E. Roosevelt Blvd., Philadelphia, Pennsylvania.

STINSON LYCOMING: 4-place cabin. Rate of climh, hank and turn, etc. Licensed to April, 1935. Acquired in deal. Have no use for it. First $1150 takes it. A. C. Lohman, 325 San Gabriel Drive, Rochester, New York.

FOR SALE: J-5 Standard; steel prop, new tires, set brakes; 150 hours since plane and motor overhaul, licensed June '35; $1800. Would be interested in crop dusting for reliahle party, reasonable rate. A. F. Axtman, Springfield Airport, Mass.

FOR SALE: Packard Diesel aircraft engine. Total time, 90 hours. No reasonahle offer refused. P. O. Box 8925, West Palm Beach, Florida.

9-CYLINDER J-4 Wright Whirlwind and one 4-cylinder Caminez motor, including magnetos. For sale very cheap. Stich, 337 East 64th Street, New York City.

TRAVEL AIR 4000: Axelson; brakes, navigation lights, dual controls; perfect condition, relicensed to May 1935; real bargain, $675. Yaryan Airways, Transcontinental Airport, Toledo, Ohio.

AERONCA C-3: 2-place, 1932 model. Good condition, licensed until May 1935. Consider late model light car. B. D. Griffin, R.F.D. No. 5, Box No. 41, Fort Worth, Texas.

MOTORS: One Wright J-5, standard cylinders; only around 300 hours total time. Cirrus Inverted, supercharged, only 16 hours since new. One Cirrus Inverted, only 12 hours total time since new. New Szekely motors in the crates. Used J-6 props, not damaged. $80. Sun Aero Motors & Supplies, 10529 Gratiot Ave., Detroit, Michigan.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

TRAVEL AIR J-5: Newly recovered, upholstery new, steel propeller; motor and ship in A-1 condition throughout. Will sell with or without motor or will accept airplane or car in trade. Floyd Becker, Grand Rapids, Michigan.

LATE TRAVEL AIR J-5; Only 370 hours; fuselage recovered, wings refinished, international orange; equipped late oleo landing gear, brakes, steel propeller; compass, air speed, duals, like new throughout; $1,125. CURTISS JR.: 194 hours, brand new condition, recently refinished, motor overhauled; priced to sell. 254 Niagara Falls Blvd., Buffalo, New York.

GREAT LAKES TRAINER: Like new; completely recovered; red and cream. Semi-air wheels. $1,175. Will consider trades. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Penna.

WACO TEN: Newly recovered hy Bellanca factory; 2 OX-5 motors, Scintilla mag, lot spare motor parts. Sacrifice all, $500. Ted Slater, 1025 Yates Avenue, Marcus Hook, Pennsylvania.

FOR QUICK SALE: Two 3-place center section Eaglerocks. One OX5, completely Millerized. One Kinner 125 h.p. Both ships are licensed and are in perfect condition. Best offer takes them. Herbert Stigman, Dundee, Michigan.

WACO F: Kinner 125 h.p., excellent condition. Brakes, steel propeller, wheel pants, exhaust ring, etc. Licensed recently. $1400. John Shosie, 417 Callendar Ave., Peoria, Illinois.

OX-5 CHALLENGER: Perfect condition, ship and motor just overhauled and relicensed; semi airwheels, Miller action; turns 1450 on ground. Will teach huyer to fly. $650 or trade for Aeronca two-place. K. Raymond, 25 Vose Ave., South Orange, New Jersey. South Orange 2-7070.

KINNER K-5 American Eagle: Model 201. Instruments, motor and plane in perfect condition. Navigation lights, air-wheels. Licensed to July '35. $850. Archie MacDougall, Pembina, North Dakota.

WACO 10: $275. Always hangared, covering year and half old, motor and prop 30 hours old. Extras for motor and ship. Excellent huy; want faster ship. Will deliver for expenses. Beverly Howard, Airport, Charleston, South Carolina.

WACO F: Kinner 125; excellent condition, always hangared, privately owned, no student instruction, licensed to Feh. 1935. $1800. J. W. Barnhill, 1914 Freeman, Owenshoro, Kentucky.

ONE NEW LAMBERT 90 Cavalier with steel propeller and latest equipment, at a bargain. Also several new ships less engine. One used Genet Cavalier, licensed and in perfect condition; $800. Star Aircraft Company, Bartlesille, Oklahoma.

FOR SALE: Waco OX-5, less 50 hours on motor since hrand new; just completely rehuilt, $550. Waco: Wright 200 h.p. motor, recently overhauled, $1200. Wanted: Aerol type landing gear for Waco J-5. J. Rush Wimherly, Jr., Arcadia, Louisiana.

LAMBERT MONOCOUPE: Brakes, semi-balloons, metal propeller, NACA cowling; 60 hours since engine major; ship recovered last November; licensed Decemher 1934. $1475 cash. AERO DIGEST, Box 1833.

FAIRCHILD 22's: 3 of them. Cirrus inverted motors; one hrand new. One Fleet: model 9; wheel pants, starter, special instruments; like hrand new. Jack Byrne Flying Service, Central Airport, Camden, New Jersey.

STINSON JR: Lycoming powered. We have two for sale. One standard and one deluxe. Both planes privately owned and in exceptional condition. Also other planes from two-place trainers to six-place cabins. Write for complete information. Bredouw-Hilliard Aeromotive Corp., Municipal Airport. Kansas City, Missouri.

ROBIN OX: Ship and motor excellent condition. Millerized. Fahlin prop, Bosch mag, high compression, fast. Licensed until August 1935. $400. Bill Clifton, 1427—21st Street, Des Moines, Iowa.

RYAN B-5: Wright J6-9 300 h.p. motor. Licensed. Goodrich air-wheels and brakes. Total time less than 1000 hours. Recently completely recovered. Always kept in finest possible shape. A hargain at $1800. Parks Air College, East St. Louis, Illinois.

WACO "C": Continental A-70; for sale. Fully equipped for night flying. Always privately owned. Licensed to November. Ship like new. J. F. Tuohy, Jr., 110 York St., Olean, New York.

TRAVEL AIR A-4000: Axelson 150 h.p. motor, numher 136; 248 hours on motor, 38 hours since top overhaul. Ship and motor in excellent condition. Licensed until June 1935. 68 gallons gasoline capacity; hrakes, steel propeller, genuine hrown leather upholstery, adjustable parachute seat, booster magneto, navigation lights, haggage compartments, usual instruments plus Pioneer compass, air speed, eight day clock and hank and turn. Ship always owned hy Kendall Refining Co. Bargain at $1,550 cash. Address Jack Lenkard, c/o Kendall Refining Company, Bradford, Pennsylvania.

LICENSED Challenger Rohin. Just had top overhaul. Recovered last summer. $800 cash, at Asheville, N. C. Robert Turner, 825 Juniper St., Atlanta, Georgia.

SAVOIA MARCHETTI amphihion: 3-place, Kinner K-5, Heywood starter, standard instruments; less than 100 hours; always hangared at factory. $1200 cash, no trades. Harry Freedman, 270 Madison Avenue, New York, N. Y.

WACO F: Warner; speed ring, metal propeller, $1375; Great Lakes, late series, beautiful condition, $1150; OX Challenger, overhauled and relicensed, $450. Neil R. McCray, Fairview, Penna.

CAVALIER LAMBERT COUPE: Steel prop, air wheels. Ship like new and in A-1 condition with small amount of time. Sell or trade. Central Air Service, Grand Rapids, Michigan.

FOR SALE: Cirrus motor, English Mk. III, like new, 22 hours total time. Quick sale $185. Ben Meyer, Morenci, Michigan.

WACO 10: Just recovered, new license, $385. OXX-6 American Eagle with two Scintilla magnets, $375. Warner Stinson cahin, $785. Pioneer Aviation, Airport, Syracuse, New York.

STINSON RELIANT: For Sale, Stinson Junior 1933 Reliant. Just one year old. De Luxe joh. Complete instrument panel. Radio, landing lights, flares, rate of climh, bank and turn, Sperry gyroscopic compass, Sperry artificial horizon, 8-day clock with flying time recorder. Ship has had 220 hours; formerly personal plane E. L. Cord; Lycoming motor in perfect condition. Write or call: Mace Naylor, 406 California Bank Building, Beverly Hills, California. Phone: CR 6600.

SIKORSKY: Twin-motored, latest type. Just completely overhauled. Will sell at sacrifice or consider any proposition. Excellent condition. Never cracked. AERO DIGEST, Box 1843.

BUHL BULL PUP: A-1 condition. 96 hours total time. Air wheels. Licensed until May, 1935. $375; no trade ins. Arthur Campbell, 721 Clinton Street, Kalamazoo, Michigan.

WARNER WACO F: No hours since top overhaul, total hours, 245. Fine condition. Air wheels, hrakes, starter. $1,550. Skyways, Inc., Cleveland, Ohio.

2 WACO CABINS: 210 Continental; de luxe equipment. Many extras; prepared for radio. Motor just majored. Perfect condition throughout; $3,200. Late 1933 Cahin, Continental 210, with both floats and wheels; little time since new. 4-place Stinson with Wasp, Jr. All in perfect condition. $3,500. Airview Flying Service, Red Bank, New Jersey.

FORD TRIMOTOR: J-6 330 h.p. engines; total time, 800 hours. Ship and motors in heautiful condition. Speed rings on outboards; $5,000. Triangle exhihition chute, 24-foot seat pack, 28-foot back pack; $125. J-5 Standard steel propeller, newly reconditioned; $75. J. Wood, 1238 N. Lomhard Avenue, Oak Park, Illinois.

MONOCOUPE 70: Rubher mounted Velie; no engine time since overhaul; licensed to July 15, 1935. $475 cash. E. T. Judson, 611 Dorian Road, Westfield, New Jersey.

FOR IMMEDIATE SALE OR EXCHANGE: 14 certified airplanes, as follows: J6-9 330 h.p. 6-place Stinson Cahin ship; 2 J-5 B-1 5-place Ryans, excellent condition; J6-5 175 h.p. 3-place Curtiss Rohin cahin ship; J-5 Waco seaplane, fully equipped with Edo floats and Heywood air starter, condition like new throughout; J-5 3-place Travel Air, late type; Lycoming powered Stinson Junior; J6-9 330 h.p. Straight Wing Waco; J-6 B-5 6-place Ryan cabin ship; J6-7 250 h.p. Taper Wing Waco; OX-5 Type 2000 Travel Air; Szekely 45 h.p Curtiss Pusher; Wright Cyclone powered 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean husiness. Will accept good late model cars on deals. Terms to responsible huyers. Buy now hefore prices advance. Becker-Forner Flying Service, Inc., Jackson, Michigan.

WACO CABIN; New June 1933. Flown 218 hours, just relicensed, excellent shape. Property of prominent husiness man. Wing root fairings, pants, hank and turn, rate of climh, radio shielded, radio equipped; special paint, red leather upholstery. Motor has just heen top overhauled. Cost $7,300. Asking $5,000. Crosley Airport, Sharonville, Ohio.

CURTISS-WRIGHT SEDAN: Four-place. Challenger powered. Battery, starter, lights. Actual ship time less than 275 hours. Truly heautiful job. $1,275. Joe Grant, Middle River, Maryland.

WARNER-POWERED Kreider-Reisner Challenger: Licensed April, 1935; A-1, exceptional performance, extra parts, hrakes, steel propeller; $975. Consider trades. E. O. Smith, 527 East Main, Murfreesboro, Tennessee.

ATC 63 TANK TRAVEL AIR: Steel prop, low pressure tires, hrakes, navigation, landing lights. Licensed; excellent condition. Few motor hours. Priced to sell. J. Henry Wall, 2107 Perkins, East Omaha, Nehraska.

J6-5 WACO: 3-place open. Completely overhauled and recovered within the last 100 hours. Steel prop, hrakes and drag ring. Never cracked; $1,200. Also propeller hubs for J-5, Velie and OX. J. W. Lytle, Box 263, Bridgeville, Penna.

WARNER PITCAIRN Fleetwing: NC license. $650. Will demonstrate or give huyer flying instruction. Eastman N. Jacohs, 148 La Salle Ave., Hampton, Virginia.

3-PLACE BURLINGTON OX-5: Biplane. Total 60 hours. Taylor Camphell, Bonaparte, Iowa.

TRAVEL AIR 4000: J-5; 3-place hiplane. Beautiful joh. Excellent condition, licensed, ready to go anywhere. Starter, hrakes, complete instruments. Ideal for sign towing. Roger Pennock, 501 Cooper Street, Camden, New Jersey.

OX-5 ROBIN: Licensed to May 1935. Ship and motor excellent condition. Like new inside; always hangared, never used for students. 135 hours total time on ship and motor. Duals, semi-air wheels and hrakes. Bottom price, $490. Will trade on Aeronca two-place. H. C. Harris, 908 S. Jefferson, Roanoke, Virginia.

DRIGGS SKYLARK: Powered with Rover 75. Excellent condition and small amount of time. Air wheels and other extras. Sell or trade. Central Air Service, Grand Rapids, Michigan.

FAIRCHILD: 5-place; on floats or wheels. Fuselage recovered, J6-9 modernized, electric starter. Crescent J6-9; Motor modernized; will sell with or without motor. Savoia Amphihion, 125 Kinner; 164 hours, 7 hours since wings recovered, motor majored. Curtiss Rohin, J6-5, 140 hours, excellent condition. Several others. Chuck O'Connor, Barnes Air Service Co., Westfield, Massachusetts.

OX WACO 9: Licensed, in good condition. Two OX Waco 90's. One American Eagle OX. One two-place Pietenpol powered with Model A Ford motor. Livingston Airways, Waterloo, Iowa.

VELIE MONOCOUPE: $395. Challenger Rohin, $1.100. Curtiss Junior, $375. Waco F, $1,350. Kinner American Eagle, late model, $985. Pioneer Aviation, Airport, Syracuse, New York.

FOR SALE: Waco four-place cahin, late 1933 model; flares, landing lights, radio; total flying time, 75 hours. Will sacrifice. AERO DIGEST, Box 1844.

TAPERWING WACO: J6-7; perfect condition; plenty of extras: privately owned; licensed to June 1935; accept any reasonable cash hid or trade. AERO DIGEST, Box 1849.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

● PLANES AND ENGINES FOR SALE

MONOCOUPE: Kinner K-5. My personal plane; always hangared; wonderful shape throughont; $950 cash. Send for complete description. W. F. Kaltenbach, 316 No. Butler Boulevard, Lansing, Michigan.

FOR SALE OR TRADE: 1 J-5 Pitcairn PA-6. 1 J-6 Ryan B-5. 1 Cirrus Avro Avian. Other airplanes availahle. Deemer Aircraft Sales Co., Brookville, Pennsylvania.

SIX-PLACE TRAVEL AIR cahin: powered J-5, just majored. Licensed May '35. Full night-flying equipment; toilet; turn and hank, etc. (Complete extra accessories for J6-9 installation, except motor and propeller). Beautiful. Sound. Suitahle for airline. A money maker. Reasonahly priced. Never cracked. Will take late Monocoupe in trade. Employers' Mutuals, Louderman Building, St. Louis, Missouri.

EAGLEROCK J-5: Privately owned; 298 hours, never damaged; steel propeller, Bendix hrakes, compass, navigation lights; cost over $7,200. Sell $1,125. ALEXANDER FLYABOUT: Only 182 hours, 2-place cahin side hy side; new condition, just relicensed; cost $1,625, sell for reasonahle offer. 254 Niagara Falls Blvd., Buffalo, New York.

TRAVEL AIR 4000: With Speed Wings. Tops 140 m.p.h. Custom finish like new. Steel propeller. Spinner, ring, semi-airwheels and hrakes. Large gas capacity for cross country or racing. J-5 engine, no time since top overhaul, 160 hours total; real hargain at $1,350. T. E. Byrpn, 14745 Coit Road, Cleveland, Ohio.

KINNER K-5 BIRD: Just assemhling; major overhaul on ship and motor, special paint joh, air wheels, new upholstery, $1,200 cash. Lombard Airport, Lombard, Illinois.

FOR SALE: J-6-9 330 h.p. 6-place Stinson cahin ship. Excellent condition throughout. No reasonahle offer or proposition refused. Terms to responsihle huyers. Michigan Aero Motors, Jackson, Michigan.

TRAVEL AIR W-4000: Warner 125 h.p. motor, number 568; 20 hours since overhaul. Ship completely overhauled and recovered last October. Licensed until June 1935. 60 gallons gasoline, hrakes, steel propeller, adjustahle parachute seat, map rack, genuine hrown leather upholstered, hooster magneto, baggage compartments, navigation lights, usual instruments plus air speed, compass, clock, bank and turn. Ship and motor in excellent condition. Privately owned; never cracked. Bargain at $1,550 cash. Address Howard H. Greene, 74 Jerome Avenue, Bradford, Penna.

FOR SALE: Kinner Sport Wing, Model B-2, new June 1, 1934, with latest Kinner B-5 engine. Entire plane finished in pale gold. Total time, 45 hours. Price $2,750, flyaway. Du Pont Airport, Wilmington, Delaware.

THREE USED SHIPS in excellent condition: J-5 Fledgling (for banner work); Keystone Commuter (amphihion); J-5 Pitcairn Mailwing (hlind flying equipped); radio, flares, etc.). For further information or inspection: Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Penna.

CHALLENGER COMMAND-AIRE: Good condition; licensed April, 1935. Control surfaces recently recovered. Usual instruments. $650 cash. J. A. Pullen, Peoria Airport, Peoria, Illinois.

FOR SALE: Waco F, Kinner B-5; 480 hours. Air speed, bank and turn, ship recovered, red fuselage, Diana cream wings, and tail group. $1600. Muncie Aviation Corporation, Muncie, Indiana.

WACO F: Warner 125. Engine and airplane in splendid condition. Privately owned. Am purchasing Fairchild cahin. 50 hours since complete major overhaul costing better than $400. $1,350 at St. Louis. D. D. Walker, care St. Louis Flying Service, Lambert Field, Robertson, Missouri.

PRIVATEER AMPHIBION (P-2): Less Warner, with complete overhaul, steel prop, Heywood starter, extras, $1,000; Travel Air B-4000, 75 hours since complete overhaul ship and motor, all instruments, landing lights, semi-air wheels. $1,400; sale or trade. New York. AERO DIGEST, Box 1848.

ROBIN: Challenger-powered. Complete flying instruments. Special paint job. Always hangared. Beautiful ship and good huy for cash. Consider trade smaller ship. Metropolitan area. AERO DIGEST, Box 1839.

WACO OX-5: Model GXE; fine shape, well kept and licensed. Price $500. Robert G. Starrett, Sheldon, Iowa.

100 AIRPLANES: $80 up, flyaway. Repairahle crack-ups, $30 up. Send 20c for complete list with owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

SELL OR TRADE: Challenger Rohin, just recovered; 100 hours on motor since overhaul; full airwheels, landing lights. Walter C. Hartman, 4061 Vinceton St., Pittshurgh, Pennsylvania.

J-5 TRAVEL AIR 4000: Fully equipped for hlind and night flying. Airwheels; hrakes; speed ring; flares; metal propeller. Recently recovered. $1,050. Challenger Robin: Just recovered. In excellent condition. $850. Stinson Jr. SM8A: Like new. $1,650. Indiana Air Service, Munícipal Airport, South Bend, Indiana.

LOOK—$495 huys Curtiss Rohin, licensed to 1935. High compression OX. Consider Ford or Chev as part payment. Carl Hanson, 614 Market Street, Youngstown, Ohio.

MUST SELL Curtiss Rohin, Millerized OX-5, dual controls, Pioneer instruments, licensed until Decemher. Perfect throughout. M. J. Polasky, Byesville, Ohio.

GIPSY MOTH: Recovered, airwheels, $1,000. Warner Cessna, perfect, $900. Wallace Touroplane, LeBlond Davis, Floyd Smith parachute, late Kinner KB-5: all in excellent condition. John D. Jacoh, Malvern, Pennsylvania.

WARNER WACO F: With or without motor, in slightly damaged condition. Needs one wing, small repairs on fuselage. Undercarriage and motor unhurt. Central Air Service, Grand Rapids, Mich.

WACO CABIN: Late 1933; $3,800. Total time, 100 hours; 210 Continental motor; electric starter and generator; 70-gallon gas tanks; landing lights, landing flares, Pioneer turn and hank indicator, Pioneer rate of climh indicator, etc. Chevrolet, 209-30 Northern Boulevard, Bayside, N. Y., or phone Bayside 9-7600.

FOR SALE OR TRADE: NB-3 Barling, OX-5 Rohin, American Moth. For cracked ship or car as part. A. J. Hartman, Burlington, Iowa.

DRIGGS SKYLARK: Inverted Rover motor. Licensed to June. Semi-air wheels. Instruments in both cockpits. Excellent condition. Will sacrifice for cash. S. H. Leslie, Pikesville, Kentucky.

$275: CURTISS JUNIOR two-place monoplane. Identified; can be licensed. Will trade for light OX-5 licensed three-place ship. Knauf Flying Service, Punxsutawney Braehreeze Airport, Marchand, Pennsylvania.

DH GIPSY MOTH: Licensed to October; full airwheels; racing windshields; Pioneer airspeed; wing slots; total time 526 hours; recently recovered and top overhauled; excellent condition; $850 cash. W. R. Reese, Box 480, Greensboro, North Carolina.

TRAVEL AIR: Late 1930. Licensed. Good fahric, new tires. Total ship time 250 hours. OX-5 radioshielded. Stressed for J-5 and/or pontoons. A real buy, $500. L. Cameron, Cleveland Airport, Cleveland, Ohio.

WARNER TRAVEL AIR: 4000: Good condition, licensed. New covering, hrakes. $850, cash. Also Warner motor for sale, or will trade for J-5 Wright. Earl Sark, Cookeville, Tennessee.

CESSNA J6-7 Cabin monoplane. 20 hours since complete recover joh and motor major overhaul. $1,550. Irvin parachute: 24-foot pongee silk seat pack, manufactured August, 1930, guaranteed clean, perfect, $85. Complete set Warner Cessna wheel and hrake assemhlies, $10. Carl V. Teeters, 212 E. Duncan, Columhus, Ohio.

CESSNA J6-7: 250 h.p. A-1 condition, reasonahle price for quick huyer. P. J. K., 2043 Spring Garden Street, Philadelphia, Pennsylvania.

FOR SALE: Arrow Sport, Kinner motor. 258 hours; top overhauled 238 hours. Semi-air wheels, hrakes; covering A-1. Will trade. What have you? B. A. Miller, Wyaconda, Missouri.

LOCKHEED SIRIUS: With Wasp C; entire ship and motor just major overhauled. Ship painted all white, with red and gold stripes. Equipped with hlind flying instruments, electric starter, landing lights, wheel pants and sliding windshield. Total time on motor, 325 hours; ship, 200 hours. Price $5,000. Will accept smaller ship in trade Andy Stinis, Floyd Bennett Field, Brooklyn, N. Y.

STEARMAN J-5: Licensed till July, 1935. Motor in good shape. Just had top overhaul. Write Samuel Barnitt, 313 Springfield Avenue, Hashrouck Heights, New Jersey.

STINSON "S": Less motor, prop, left wing, tires and tubes; good condition, leather upholstery, hlack and silver. $475. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

DH MOTH: Licensed, excellent condition, Goodyear Airwheels. For sale or trade for Waco F or similar three-place plane. History of ship on request. W. C. Morton, Route 7, Knoxville, Tenn.

STRAIGHT WING WACO: J-5; engine just major overhauled; Heywood starter, Bendix hrakes, Standard steel propeller; splendid condition throughout. $1,500. Martin Devereaux, 1366 McBride, Far Rockaway, New York.

STINSON: Warner motor; 4-place, licensed. Motor and ship recently overhauled; excellent condition. Never cracked up. Bargain for immediate sale. AERO DIGEST, Box 1842.

CURTISS JUNIOR: $450. Just relicensed. Would consider as part payment on J-5 Waco that needs overhauling and recovering. D. Whitworth, 182 Conover Avenue, Nutley, New Jersey.

WACO J-5: In excellent condition; air starter, steel propeller, Pioneer landing lights and complete night equipment. Will accept plane or car in trade. Central Air Service, Grand Rapids, Michigan.

B-1 RYAN: Wright J-4B; just relicensed; finished red and silver. Ship good condition; engine overhauled 25 hours hack. $800. L. R. Muse, 180 Luckie, Atlanta, Georgia.

FIVE-PLACE J-5 Fairchild cahin, licensed. Excellent condition. Would consider trade on light trainer. WANTED: Two-place Aeronca, good condition. I. M. Tull, Jr., Chapel Hill, North Carolina.

CURTISS-WRIGHT JR.: Licensed, good condition; cheap. Curtiss Rohin; engine, ship just completely overhauled, recovered. Will buy or trade for Fleet or Waco F. Air Activities Airport, West Chicago, Illinois.

SPEEDWING BULL PUP: First class condition throughout. Ship recovered. refinished and relicensed. Motor completely overhauled. Flown ten hours since, $450. Hildreth Zehring, Germantown, Ohio.

FOR SALE: G-2 Flamingo, powered hy Wasp C; 8-place; $1,600 cash; perfect condition. 1745 Continental Illinois Bank Bldg., Chicago, Illinois.

SAVOIA-MARCHETTI: 3-place amphihion; Kinner K-5; just relicensed. Heywood starter. 300 hours. $785 cash, or trade. Robert Stieher, Albert Lea, Minnesota.

FOR SALE: Travel Air 3-place, Wright J-6 540; 50 hours since major overhaul on motor and ship; 450 total time. Semi-air wheels, steel propeller, hlind flying instruments. $1,400. Mississippi Flying Service, Clarksdale, Mississippi.

WACO 10: Licensed March '35. Motor good, top Millerized; about 1400 hours on ship. Bargain, $500. Also Waco 10 parts. Peter K. Johnston, Milan, Michigan.

WACO J-5 Straight Wing: on Edo floats. Total time 350 hours; just relicensed; floats have water rudders. Landing gear for ship also. Sell less motor; accept trade. Bargain at $1,650. J. Loesing, 206 Martense Street, Brooklyn, New York.

WACO J-5 Taper Wing: 250 hours. Just relicensed. Recovered six months ago. Navigation lights, landing lights, new steel prop; motor just had top overhaul. Sell less motor. Bargain at $1,300. Accept trade. J. Loesing, 206 Martense Street, Brooklyn, New York.

SELL OR TRADE: J-5 B-1 Ryan; A-1 condition; air wheels; for J-5 Standard or trimotor. Cash difference. Roger Mensing, 1218 Jones Street, Fort Wayne, Indiana.

J6-5 STRAIGHT WING WACO: Ship excellent. Motor recently majored. Licensed March, 1935. Two-place Aeronca: 1933 model. Licensed August. 1935. Both equipped for night flying. Beautiful shops, sound throughout. Very reasonable. Colonel Brown, 317 N. 11th, St. Louis, Missouri. ....

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

WANTED TO BUY OR TRADE

WANTED: Motor and fuselage parts for 6-place 300 h.p. Buhl Airsedan. Will buy complete Buhl ship in any condition. Box 199, Roseville, Mich.

WANTED: Walters, Jacobs motors or parts; best buy I can get; must be bargain. Send details first letter, immediately. Brost, 4511 Woodland Ave., Philadelphia, Pennsylvania.

WANTED: Used licensed 2- or 3-place plane, powered from 90 to 110 h.p. Name full particulars and best cash price in first communication. Ken Morey, Adrian, Michigan.

WANTED: Licensed airplane or one that can be repaired for relicensing. Rising Sun Aircraft School, Inc., 857 E. Luzerne, Philadelphia, Penna.

WANTED: Waco F, Warner or Kinner. Must be in perfect condition and reasonably priced. Give full history and furnish photo. AERO DIGEST, Box 1832.

WANTED IMMEDIATELY: American Cirrus upright engine, any condition. Lycoming 210 h.p. engine and steel propeller for same. Aero-Ways, Inc., Cleveland Airport, Cleveland, Ohio.

WANTED: 4- or 5-place cabin ship, preferably in need of rebuilding and overhaul, or partly cracked up. Lombard Airport, Lombard, Illinois.

TO RENT: A small plane on floats or seaplane, dual controls, for month of September, use about 50 hours. No fuel or pilot needed. Name plane, size, price, Eastern States. AERO DIGEST, Box 1840.

WANTED: ELECTRIC DYNAMOMETER for engine testing; capable of absorbing 100 horsepower; preferably not over 150 horsepower. AERO DIGEST, Box 1837.

AERIAL CAMERA WANTED: Prefer Fairchild. Also quick-attachable type parachutes. Will pay cash. Must be priced right. AERO DIGEST, Box 1838.

WILL PAY BEST PRICES for used airplane and engine parts. Write us for an offer. Give type and condition. Aviation Salvage Company, 6205 South Menard Avenue, Chicago, Illinois.

WANTED: For test purposes, Challenger Robin with or without motor. Licensed, A-1 condition. Must be located Eastern seaboard, north of Washington. Spencer-Turnhull Co., 278 Main Street, Hartford, Connecticut.

WANTED: Kinner B-5 125 horsepower engine; new or almost new. Frank Steinman, Roosevelt Field, Mineola, New York.

WANTED: Small amphibion—Savoia, etc. Also quick connector chute. Quote lowest prices. AERO DIGEST, Box 1845.

PARACHUTES FOR SALE

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

TWO SWITLIK back packs: Look like new and are as good as new, $85 each or $160 for both. Two Russell seat packs, worn only few times; make offer. Neil R. McCray, Fairview, Penna.

POSITIONS WANTED

TRANSPORT PILOT: 700 hours; A & E mechanic. Age 27. Single. Six years flying. Clear flying record. Fly anything, anywhere. Roman J. Nemmers, Dell Rapids, South Dakota.

TRANSPORT PILOT: 21 years old, 800 hours both open and closed ships; 2A and 1A ratings; positively no liquor or tobacco. Consider anything. AERO DIGEST, Box 1834.

TEST PILOT: Graduate engineer; well qualified in all phases of flight testing, particularly research on experimental and high performance types, desires new connection. Now employed. AERO DIGEST, Box 1835

AERONAUTICAL ENGINEER: Five years experience in aeronautical research and flight testing, desires change. Specialized in mechanical and production engineering in college. Will consider teaching. AERO DIGEST, Box 1836.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

WANTED: Pilot with small amphibion to join expedition for South America. Arrangements. AERO DIGEST, Box 1846.

TRANSPORT LICENSE, $1,100. Pilot with over 15 years flying experience will instruct personally two students for transport license. Have good plane and can locate in your city. AERO DIGEST, Box 1841.

MISCELLANEOUS PRODUCTS AND EQUIPMENT

PUBLIC ADDRESS SYSTEM: A powerful unit which will cover a crowd of 5000. Includes microphone, electric phonograph pickup, radio attachment. Cost $300. Will sell for $60. Neil R. McCray, Fairview, Pennsylvania.

NEW TACHOMETERS: J. M. Jones or Jaegers, $3.95. New Scintilla magnetos, type VAG9D, $18. New genuine leather safety belts, $1. Oil sight or pressure gauges, 50 cents. Inertia starters, Aeromarine, $8. New Liberty cylinders, $4. New booster or rotary magnetos, $2. New 4, 6, 5, 8, and 12 cylinder magnetos, $5. Altimeters, $1; mag switches, $1; hall bearings cheap. N. Burke, 4003 Roland Ave., Baltimore, Maryland.

ENGINES, AIR WHEELS, Eaglerock parts: Kinner K-5, $195 Szekely 45 h.p.; Warner 100 h.p.; Wright J-5, Wright J-6; new Kinner parts, 40%; pair 22x10-4 air wheels, new tire and tubes, pair 650x10 Warner brake type wheels and tires, tubes; pair 850x10 brake type, almost new tires and tubes; 25x11-4 air wheel tire and tube; 11x12 new low pressure tire and tube; 44x10 new heavy duty tire; pair 27-inch Army streamline tires; pair 30x5 Bendix wheels, brake assembly, tire and tubes; many other sizes. Eaglerock wings, fuselage, tail parts, landing gear parts, etc. Irving Russell parachutes, cheap. Becker Flying Service, Buffalo, New York.

FOR SALE: Wings, tail units, fuselages—Travel Air, Waco, N-B Trainer, Eaglerock, Swallow, Waco Taperwings, primary gliders; wing covers, miniature cars, and complete stock of new material. Williams-Raitbel Aircraft, Gill, Mass.

FOR SALE: One set of Edo Pontoons for Waco F-2. Complete with struts, wires and rudder. Also one Continental A-70, 165 h.p. engine, and reconditioned Hamilton Standard propeller for same. DuPont Airport, Wilmington, Delaware.

PROPELLERS: Lowest prices in the country. Steel props for J-6, J-5. A few Hamilton wood props at $15. Flottorp, Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

PROPELLERS: Metal, wood, Micarta. Direct electric starters with battery, $50; Series 7 electric inertias. Tail wheels. 26 x 4 wheel pants. Camera. Travel Air, Eagle wings. 2 place Boeing army job, Liberty-powered. Klemm. OX-5 ships. Terms, trades. AERO DIGEST, Box 1847.

TIRES; TIRES: We still have a few new tires left of the following sizes: 1100 x 12, $30. 950 x 12, $20. 30 x 5, $6. 24 x 4, $4. 18 x 3, $5. 16 x 4, $6. 20 x 2, $3.50. One 600 x 10, $10. One pair full air wheels, tires and tubes, 26 x 11-6 less brakes, $60; excellent rubber. Sun Aero Motors & Supplies, 10529 Gratiot Avenue, Detroit, Michigan.

INDEX TO ADVERTISERS IN THIS ISSUE

WILL HELP YOU PREPARE FOR ANY LICENSE TEST

Aeronautics

A Ground School Textbook

by HILTON F. LUSK

Transport Pilot; formerly Dean, Boeing School of Aeronautics

175 Illustrations, 224 Test Questions, Price $3.25

THIS is a complete ground school course in handy book form. It clearly and thoroughly explains all the subjects you need to understand to pass the written part of the government examination for a license as an airplane pilot in any of the grades—including transport pilot, or as an airplane or engine mechanic. No one who masters this book will have any difficulty in answering any question that may be asked in the government examination. So clearly and simply written that you will have no difficulty in grasping its explanations even if you must study at home without the aid of an instructor. 224 questions like those given in the official examinations help you test your understanding of each subject.

CONDENSED OUTLINE

Principles of Flight: Explains all the essential aerodynamic factors and their application to airfoils.

Airplane Construction and Operation: Principles of construction and materials employed. Methods for working wood and fabric. Welding metal planes and parts. Flying. Elementary aerobatics.

Propellers: Theory, Construction and maintenance of wood and metal propellers. Variable pitch propellers.

Engine Construction and Operation: Theory: How to determine engine efficiency. Types of engines, construction materials. Fuel systems, carburetors, ignition systems. Engine operation and maintenance.

Blind Flying Instruments: Use of attitude instruments in blind flying. Absolute and relative references. Inclinometers. Pitch, roll, turn indicators. Operating principles of gyroscopic instruments.

Engine Instruments: Construction and operation of tachometers, pressure gages, thermometers, fuel quantity gages, etc.

Safety Appliances: Parachutes, Aircraft radio, antenna details, shielding methods, etc.; radio range-beacons and markers.

Avigation Maps and Piloting: Explains and illustrates various map projections and their use in avigation. Practical hints on piloting.

Deed Reckoning: Details of methods of dead reckoning with solutions of practical problems.

Avigation Instruments and Equipment: Describes and illustrates each of the avigation instruments found in aircraft and explains theory so you can understand principles on which it operates.

Principles and Applications of Meteorology: Effects of winds, storms, visibility in relation to flight.

A PILOT'S TRAINING GUIDE

Practical Flying

by Major B. Q. Jones, *Air Corps, U. S. Army, formerly Chief, Aviation Training, A.E.F.* $3.00.

Your flight training will cost you less and you will be ready to solo many hours sooner if you follow the practical guidance of this famous manual. Both student pilots and veteran transport flyers praise it enthusiastically. First, Major Jones describes all the parts of an airplane, instruments, etc.; discusses maneuvers in the air and explains technical expressions and slang terms. From this he proceeds to clear and concise answers to the hundreds of questions that student pilots have asked for years—information that is essential for a proper understanding of piloting. For much of the detailed information the explanations are provided in question and answer form. A wide variety of practical questions is covered, such as the most useful instruments for each class of flying, why a magnetic compass spins during fog-flying, dressing for a flight, preliminary plane inspection, cockpit inspection, controls, starting and testing the motor, first air lessons, taxying, the take-off, the initial climb, emergency landing after the take-off, straight-away flight, turns, figures of eight, speed in glides and climbs, straight glides, gliding and climbing turns, landings, solo instruction, cross-country flying, stalls and spins, flight testing a new plane, etc.

BASIC BOOK IN AERO ENGINEERING

Simple Aerodynamics and the Airplane

4th Revised Edition by Colonel C. C. Carter. *U. S. Military Academy, West Point.* 395 *illustrations.* $4.50.

This famous textbook is used by the Army cadets at West Point and by students in over 100 leading technical schools, colleges, and flying schools. It provides a clear and easily understood explanation of the fundamental aerodynamics involved in the design and operation of the airplane. In scope it ranges from the explanation of the fundamentals of air flow and production of lift to the complete airplane, its stability, maneuverability and performance. In addition there is a great deal of material on construction, navigation and equipment. Chapters include Airfoils and Their Selection; Parasite Resistance; Propeller; Complete Airplane; Stability; Control Surfaces; Performance; Dynamic Loads; Materials and Construction; Equipment; Navigation.

(fill in, tear out, and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,
Dept. M798, 15 East 26th Street, New York

Send me the books checked below. Within five days after their receipt I will either return them or send payment in full at the prices shown plus a few cents for delivery charges. (We pay delivery charges when cash accompanies order—same return privilege.)

- ☐ Lusk, Aeronautics $3.25
- ☐ Jones, Practical Flying 3.00
- ☐ Carter, Simple Aerodynamics 4.50
- ☐ Moors, Engine Manual..... $4.50
- ☐ Hartz-Hall, Rigging Handbook..... 3.50
- ☐ Eddy, Aircraft Radio..... 4.50

Name.....

Home Address.....

City.....State*.....

☐ Employed by,
☐ or Reference ..... Address.....

(Above line must be filled in unless you send cash.)

*If outside continental U. S. and Canada, send cash plus 25c per book for shipping.

"The World's Best Books on Aeronautics"

28 VOLUMES dealing with every phase of aeronautics are published by The Ronald Press Company. Thousands of students, pilots, mechanics, executives and engineers use and endorse these practical manuals.

Sent on 5 Days' Approval
Your Satisfaction Guaranteed

You can order any of the books described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.

A COMPLETE ENGINE COURSE

Aircraft Engine Mechanics Manual

by C. J. Moors, *Chief Instructor, Department of Mechanics, Air Corps Technical School, U. S. Army.* 189 *illustrations.* $4.50.

This book covers the same ground as the course given the enlisted mechanics of the Army Air Corps with the addition of much data on types of equipment adapted only for commercial airplanes. It deals thoroughly with all types of aircraft engines and their accessories. It explains exactly how they operate and the features in which the various kinds of competing equipment resemble each other and those in which they differ.

Mr. Moors supplies full instructions on proper maintenance, and shows you exactly how to go about making any necessary repairs and adjustments. Particularly important is the detailed information given on locating causes of engine troubles. The book is lavishly illustrated; photographs, diagrams, working drawings make it easy for you to follow each explanation.

Among the engines dealt with are: Pratt & Whitney Wasp, Wasp Junior, Hornet; Wright Whirlwind, Cyclone; Curtiss D-12, Conqueror, Challenger; Lycoming; Packard-Diesel; Warner-Scarab; Kinner; LeBlond; Continental; Liberty. Equipment covered includes: Scintilla Magnetos, Types AG and V-AG, Double Magneto Type SC, N Series; Eclipse and Leece-Neville Electric Generating Systems; Delco Battery-Generator Ignition System; Eclipse Engine Starters; Zenith and Stromberg Carburetors; Superchargers; Cooling and Lubricating Systems.

THE VITAL FACTOR IN SAFE FLIGHT

Airplane Mechanics' Rigging Handbook

by R. S. Hartz, *formerly Lieut. Colonel, Air Corps, U. S. Army; and* Lieut. E. E. Hall, *formerly Editor, Aircraft Servicing.* 105 *illustrations.* $3.50.

It is even more important for an airplane to be perfectly rigged than for its engine to work perfectly. Dead-stick landings are commonplace, but no plane can land safely with a collapsed interplane strut or minus one wing. This book tells you how to get an airplane into safe flying condition and how to keep it that way. It is written without mathematics in plain language that anyone can understand. The instructions are given in great detail, explaining how each operation should be done, in what order and the reasons why. The book deals fully with handling planes on the ground and in the shop; how to true up the assembled ship; how to adjust the wings and control surfaces for "hands-off" flying; the materials for patching, splicing, and repairing of all kinds; practical hints for riggers; installing and correcting compasses; methods of plane inspection.

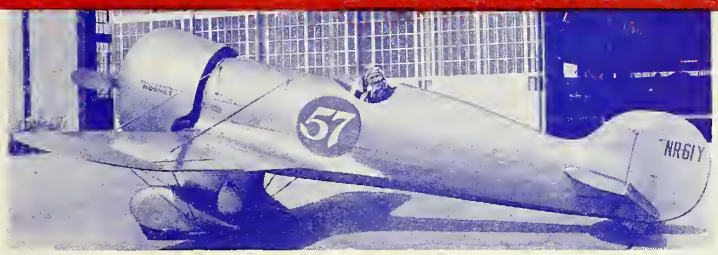
A GROWING FIELD THAT OFFERS MANY OPPORTUNITIES TO QUALIFIED EXPERTS

Aircraft Radio

by Lieut. Myron F. Eddy, *U. S. Navy. Retired.* 69 *illustrations.* $4.50.

The constantly increasing application of radio in the operation of airplanes makes the information in this book of vital interest to every airman. The only complete guide to the principles, equipment, installation, operation and maintenance of aircraft radio. Tells how it is used in aerial navigation, with complete details about apparatus, radio beacons, instrument-board visual indicators, etc.; how weather data and flight orders and reports are exchanged between airplanes and ground stations; how radio sets are installed in planes, and how the plane is electrically bonded and shielded to eliminate interference; how to service radio sets; full details of specific circuits; the Federal regulations, etc., etc.

5 MILES A MINUTE!



AMONG the new records established by Col. Roscoe Turner in his Wedell-Williams racer was his recent brilliant flight from Detroit to New York—a distance of 550 miles flown at an average speed of 5 miles a minute. Col. Turner's plane was powered by a Pratt & Whitney "Hornet" with a displacement of 1,690 cubic inches, developing upwards of 900 horsepower. As in practically every noteworthy American flight of the last decade, Thompson Valves contributed their important share to the perfect performance of the engine.

THOMPSON PRODUCTS, Incorporated

General Offices: Cleveland, Ohio, U.S.A.
Factories: Cleveland and Detroit

PRATT & WHITNEY
"HORNET"

Thompson Valves

WASP & HORNET
ENGINES

In every quarter of the globe Pratt & Whitney engines are selected to power an increasingly large proportion of the planes in commercial, military and private use.

PRATT & WHITNEY AIRCRAFT COMPANY
EAST HARTFORD, CONNECTICUT, U. S. A.

AERO DIGEST

INCLUDING

AVIATION ENGINEERING

September 1934
35 Cents

Aero Digest, *September*, 1934 *Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3.*
Volume 25. Number 3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

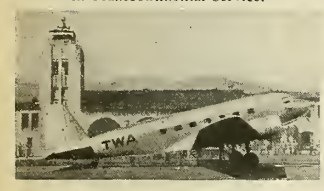
FOR an AERONAUTICAL CAREER...INVESTIGATE...

CURTISS WRIGHT TECHNICAL INSTITUTE

Grand Central Air Terminal **LOS ANGELES, CALIF.,** *Specializing in Developing*

AERONAUTICAL ENGINEERS and MASTER MECHANICS

TWA. THE LINDBERGH LINE DOUGLAS LUXURY AIRLINERS in Transcontinental Service.



AMERICAN AIRLINES. Curtiss-Wright CONDOR Sleeper-Planes in Transcontinental Service.

PAN-AMERICAN AIRLINES, (Aerovias Centrales) Hi-Speed Lockheed Electras to Mexico and South America.

CORD-VULTEE'S Hi-Speed transports, designed and built at Grand Central for Transcontinental Service.

THE OPPORTUNITY IN AVIATION WAS NEVER GREATER—BUT THERE IS ABSOLUTELY NO PLACE FOR THE UNTRAINED MAN

Your first step in entering aviation as a career is to obtain at least one year's specialized training in a reputable school. *And remember that* — REGARDLESS OF LENGTH OR COST ANY *USEFUL* AERONAUTICAL COURSE *MUST* MEET THE INDUSTRY'S DEMANDS!

Our training *does* meet this demand. *In addititon* CURTISS-WRIGHT TECHNICAL INSTITUTE is a *recognized* educational institution, *approved* by the State Departments of Education of California, Oregon and Washington. It grants college credits, is an *approved* Department of Commerce Repair Station and is also *approved* by the United States Bureau of Immigration for training non-quota students. As the training division of Curtiss-Wright, it is bound to the known standard of Curtiss-Wright, the foremost name in aviation since 1911. Our training courses are being constantly improved to keep pace with the rapid development of aviation. Our school is located in the very center of the biggest aircraft industry in the United States, thus you learn aircraft where aircraft are made and operated. Our Chief Instructors visit personally, once each month, Douglas, Northrop, Lockheed, Cord-Vultee, Menasco, Kinner, TWA, American Airlines, Pan-American Airlines and others. By actual personal contact they learn what the industry demands of its employees. Our courses are made to conform to these demands. For example—we were the first school in the United States to incorporate, as part of our training, a course in metal fabrication conforming with the industry's requirements, so that our graduates would be prepared to handle modern all-metal aircraft construction. As you perhaps already know, more men are employed in aviation enterprises within a twenty-five mile radius of Curtiss-Wright "Tech" than in any other community in the world. The *industry* is here—the *employment* is here. From our intimate contact and study of the personnel requirements of the aircraft factories and airlines our training fully meets their demands and with the definite result that our graduates have obtained preferred and steady employment. If you are looking for a school that gives a *USEFUL Aeronautical course that POSITIVELY meets the demands of the industry* the price and length of such a course is of secondary consideration and of minor importance. *Here is the place to enroll!* We invite investigation and comparison. We are confident we have something to offer you, the equal of which cannot be obtained elsewhere.

CURTISS-WRIGHT "TECH" SHOULD BE YOUR CHOICE BECAUSE:

1. It is a RECOGNIZED EDUCATIONAL INSTITUTION, APPROVED by the State Boards of Education of California, Oregon and Washington.
2. It is AFFILIATED with State Junior Colleges.
3. It is located right ON famous Grand Central Air Terminal, an International $3,000,000 airport.
4. It gives a USEFUL aeronautical course that MEETS the demand of the industry.
5. It is in the very CENTER of the huge aircraft industry of Southern California.
6. It is Located in Sunny Southern California where there is year round swimming, fishing, hunting, mountain climbing, tennis, golf, riding, etc., during your leisure time.
7. "Curtiss-Wright" on your diploma MEANS something.
8. Living conditions are *pleasant* and *inexpensive*.
9. Its courses offer PRACTICAL CONCENTRATED TRAINING.
10. Its graduates are OBTAINING preferred and steady employment.

CURTISS-WRIGHT TRAINING BRINGS RESULTS!

SPECIAL ANNOUNCEMENT!

★ HOME STUDY! A new addition to our curriculum—after careful consideration we have added a Home Study Aeronautical Drafting Course. Many prospective students, in distant localities, do not find it possible to attend our Institute. Many ambitious young men already working in aircraft factories desire to better their positions. It is for these young men our home study course has been made possible. It is thorough; it is practical and is complete. Write us immediately about this course and we will gladly send complete details and price.

MAIL THIS COUPON TODAY!

CURTISS-WRIGHT TECHNICAL INSTITUTE

Grand Central Air Terminal, Glendale, California

9 AD

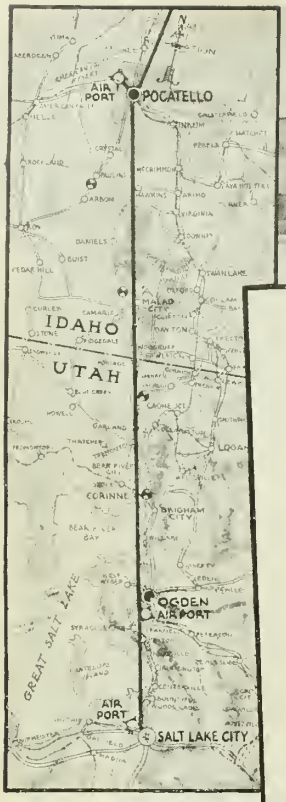
NAME_____

ADDRESS_____

_____ AGE_____

HOME STUDY DRAFTING ☐ AERO ENGINEER ☐ MASTER MECHANIC ☐

DATE I PLAN TO ENROLL_____ 19____



ALFRED FRANK,
Air Mail Contractor, Lessee
NATIONAL PARKS AIRWAYS, INC.
SALT LAKE-GREAT FALLS AIRLINE
BUTTE, MONTANA

FELIX STEINLE
VICE-PRESIDENT IN CHARGE OF OPERATIONS

June 25, 1934

B. G. Corporation
136 West 52nd Street
New York, New York

Gentlemen:

National Parks Airways, now operated by Alfred Frank, air mail contractor, has had six years of successful flying experience. Its flying operations have been conducted over a terrain rich with historical interest. Leaving Great Falls, Montana, the plane is following the trail blazed by Lewis and Clark on their memorable journey of exploration from St. Louis to the Pacific Northwest in the year 1805.

The winding Missouri river, flanked on each side by high mountains, makes a beautiful picture from the air. South of Butte the trail of these early pioneers is picked up again for a short distance. From there on to Corrine, Utah, our planes fly along the route selected by the early freighters bringing supplies into the rich placer mining district of Virginia City and Bannack.

Difficult as this country may appear from the standpoint of flying operations, the record of this line indicates that it is well protected and that this mountainous country offers every opportunity for successful landings should occasion require.

Thanks to careful maintenance, inspection and good equipment 4,000,000 miles have been flown with only two landings with passengers on account of mechanical difficulties. This record can be made only through the use of dependable equipment.

B. G. Spark Plugs have been used since the inception of the line and they have been delivering the day-in, day-out service which have assisted materially in making our flying record possible.

Yours very truly,

NATIONAL PARKS AIRWAYS,
ALFRED FRANK, CONTRACTOR

By Felix Steinle
Manager of Operations

FS/HBC

Patented in the United States and other countries

"B. G. Spark Plugs have been delivering the day-in, day-out service which has assisted materially in making our flying record possible."

THE B. G. CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 W. 52nd St., NEW YORK **Cable Address: Golsteco, New York**

Will you wait 5 years—

One of the new 100 h.p. Kinner monoplanes recently added to the Parks fleet.

OR MEET SUCCESS NOW?

PARKS graduates leaving school are meeting success NOW.

One recent graduate went directly from Parks Air College to a leading aircraft factory. In less than 15 days he was promoted to foremanship of the final assembly department.

Another went from school to his home. When he got there he found a telegram telling him to report immediately to the manufacturer of one of America's most famous planes. He is there now.

Still another hitch-hiked, by way of the air route, directly from school to the factory where he is now employed.

Three pilots recently completed their special flight training, secured their Scheduled Air Transport ratings from the Bureau of Air Commerce, and all three are now flying as full pilots on scheduled air lines.

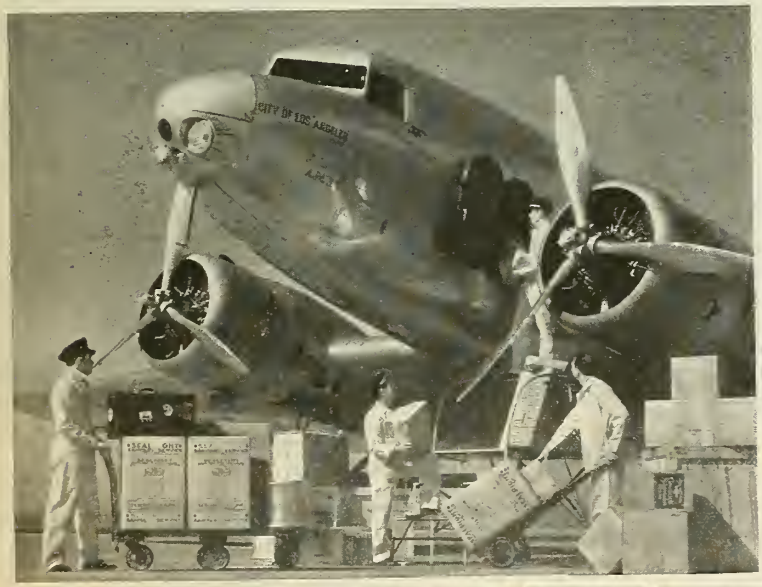
Within the past two months more than 40 other Parks graduates have made desirable connections.

At Parks Air College you will not only be preparing for your career in aviation—you will actually be in aviation. You will meet and learn to solve exactly the same problems you will meet and solve after graduation. You will be a participant in aviation. That is the reason for the remarkable success of the Parks system of training. But remember, you must have this training. A prominent manufacturer expressed it this way when a young man sought his advice about getting into aviation:

"Aviation offers a splendid opportunity to any young man who is willing to prepare himself for this field and to start literally from the bottom up. It is especially important to acquire the **technical** and **executive** training, as the mere ability to fly an airplane is not nearly as important as the other two."

You can make use of Parks training and Parks prestige to carry you to success in aviation.

The mailing of the coupon below is the beginning of your success. Mail it now!



The transcontinental TWA Douglas record-breaker. Many Parks graduates are employed by TWA and Douglas.

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Approved by U. S. Dept. of Commerce

SECTION 9-AD, EAST ST. LOUIS, ILL.

"SKYWARD HO!"
Our 44 page catalogue, completely describing Parks Air College and Parks training, will be sent free on request.

Name.....*Age*.....

Address .....

City.....*State*.....

CHECK HERE
the course that interests you:
☐ Executive Transport Pilots'
☐ A. & E. Master Mechanics'
☐ Limited Commercial Pilots'
☐ Aeronautical Engineering
☐ A. & E. Mechanics'

10,000 miles every night

On TWA's new coast-to-coast overnight schedule, Douglas Transports now fly better than 2600 miles on four flights every night between New York and Los Angeles. ¶ Douglas engineered the Transport to do this one job well. The answer lies not alone in its spectacular speed, but in the plane's ability to fly the world's fastest transcontinental schedule with clocklike regularity. Douglas Aircraft Co., Santa Monica, Calif.

D O U G L A S T R A N S P O R T

First Around the World.

DALLAS AVIATION SCHOOL AND AIR COLLEGE • LOVE FIELD • DALLAS, TEXAS

In the land of sunshine and good flying weather. Where your training is always a positive success.

YOU CANNOT BUY BETTER TRAINING AT ANY PRICE

You can't buy first-class training at prices any lower!

Investigate! Compare! We have one of the best equipped aviation training schools in America. No needless expense—no waste of time or money. WE KNOW HOW TO GET THE JOB DONE!

D. A. S. offers you

- Lowest prices for good training
- The land of sunshine — more good flying weather
- We own our own dormitories and cafe
- Sane and Safe instruction
- Less flying hazards
- A strictly up-to-date Government Approved Aviation School
- A complete, thorough and practical course of instruction
- Approved Government aircraft repair station
- Staff of expert instructors
- Complete machine, motor and aircraft shops
- Over $200,000 invested in equipment
- More good ships—no put-puts
- We teach you to use your head as well as your hands
- Free railroad fare offers
- 20 Ships—30 Motors—$40,000 stock Parts and Supplies

We have part-time work for all students, if desired.

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$ 595
Private Pilots' Course	$ 545
Amateur Pilots' Course	$ 350
Master Mechanics Course	$ 300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five per cent from the above prices for payment in full at time of enrollment.

We have found employment for seventeen of our graduates during the last 60 days. What other school can do the same for you?

Recent Transport Graduates say:

"My Transport Course was a big success and I enjoyed every minute I was at the school. You and I certainly got the job done. Thanks a lot for all favors."
HENRY JABLONSKI, *New York City*

MASTER MECHANIC GRADUATE

"I enrolled with you the first of the year and have completed the Master Mechanic's Course and I want to recommend the school to any newcomer. I passed all my examinations and tests successfully and on your recommendation am now on a good job. Thanks for everything."
HOWARD J. HENRY, *Grand Forks, N. D.*

"Last year I completed a Limited Commercial Course at your school and came back this summer and have completed a Transport Course. To my mind this is a genuine high grade aviation school and I am going to be your best booster as your instruction and equipment are just right."
FRANK MILLER, *Ashland, Ohio*

CAME 10,000 MILES TO ENROLL

"Arrived here on May 15th and enrolled for your Transport Course, and I am highly pleased with what you have for me here and find the school exactly as advertised and am doing fine. Expect to leave for home about October 1st."
JESUS VILLAMOR, *Manila, P. I.*

"Your school compares favorably with any other school in the United States and any student who comes here will get what he came for; good training in high-class aircraft and his Transport License without question. You tell 'em for me that D. A. S. is 100% O.K.!"
TOM L. KENNEDY, *Dallas, Texas*

We are affiliated with LONG & HARMAN, INC., AIR LINES

who hold Government contracts for 2,500 miles of Air Mail flying per day. Here you are intimately associated with the actual carrying of the United States Air Mail.

Long & Harman, Inc., is largely manned with D. A. S. graduates. This will continue to he our policy.

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

These special inducements are for you—Now! Write or wire for Catalog and full information.

USE THIS COUPON:

DALLAS AVIATION SCHOOL AND AIR COLLEGE
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

- Transport Pilot ☐
- Limited Commercial ☐
- Private Pilot ☐
- Master Pilot ☐
- Master Mechanic ☐
- Aviation Radio ☐
- Complete Radio ☐

Name.....

Address.....

City.....

State.....

DALLAS

AVIATION SCHOOL AND AIR COLLEGE

Major W. F. (Bill) LONG, Pres. C. E. HARMAN, Gen. Mgr.

LOVE FIELD DALLAS, TEXAS

Ride "safe" with this oil!

You will get a valuable extra margin of safety—speed—economy with Texaco Airplane Oils. Their exceptional lubricating qualities will reduce frictional drag and increase engine pull. They will maintain pressure under the greatest extremes of operating conditions. The purity and resistance to sludging of Texaco Airplane Oils will lessen overhaul expense. There is a grade that has been *proved* suitable for every engine—every type of service. Texaco Aviation Products are available at airports everywhere.

THE TEXAS COMPANY, 135 East 42nd Street, New York City

A SPECIAL MESSAGE TO DEALERS

There are great profit-making possibilities in selling Texaco Aviation Products. The demand is steadily increasing. Find out more about these quality products. Sell them at the airport you serve. Write The Texas Company, Dept. E 9

TEXACO REG. T. M.

TEXACO

TEXACO AIRPLANE OIL ★ TEXACO AVIATION GASOLINE ★ TEXACO MARFAK GREASE ★ TEXACO ASPHALT PRODUCTS (for runways, hangar floors, aprons and dust laying)

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER THREE

Contents for September

COVER DESIGN

Grumman SF-1 Scout and XJF-1 amphibion of the U. S. Navy, each powered by a Wright Cyclone engine

Published monthly by the Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy, 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5.

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

BOSTON: L. Mitchell, 80 Boylston St., Phone Hancock 5066. • CHICAGO: L. F. McClure, 919 No. Michigan Ave., Phone Superior 2802.
DETROIT: W. E. Fellows, 315 Stephenson Bldg., Phone Madison 9244. • LOS ANGELES: F. E. Samuels, 1129 Mohawk St., Ph. Dunkirk 6332.
AERO DIGEST BUREAU: 14th and F Sts., Washington, D. C., Phone National 2299

Aerial Explorations, Inc., photo

Aerial photograph of area near Spartansburgh County, South Carolina, made for the Federal Government for the purpose of studying soil erosion. This print, reproduced in approximately its actual size, at a scale of 800 feet to the inch, shows the contour lines where terraces are formed prior to planting

Opportunities for the Airplane in Government Service

REX MARTIN
Assistant Director of Air Commerce
for Air Navigation

Fairchild Aerial Surveys, Inc.

Above: Portion of a vertical photograph at a scale of 1,200 feet to the inch, showing part of a section north of Hartford, Conn., taken from 12,000 feet for tax and other purposes. Left: Area near Miami, Okla., taken as a drainage survey for the Bureau of Soils. Scale, 1,000 feet to the inch

● Federal government departments are realizing more and more that by using the airplane they can speed up their work and increase their usefulness with actual savings in expense. Aviation has long been well established in the War, Navy and Commerce departments where it is a part of the routine, but other non-aeronautical agencies such as the Treasury, Interior and Agricultural departments have increased their use of the airplane in the last few years and probably could still find many advantages for it which have not yet been touched.

Other branches of the government provide numerous opportunities for the airplane. Besides increasing their own efficiency, the widespread use of the airplane in the Federal departments would provide a further stimulus to private and industrial operations.

Many of the government departments are constantly making surveys which require the expenditure of months and even years of time and a proportionate amount of money. Some of these could be made by plane in a fraction of the period and at a fraction of the expense. This would not only make the surveys available much sooner, but because of the great savings, they could be made oftener if desired. Aircraft could also be used in many other ways.

In order to evaluate the use of the airplane in the government service, let us first take up the departments that have found it of advantage, and at the same time study the possibilities for further expansion in this regard.

The Coast Guard of the Treasury Department regards the airplane as a necessary part of its equipment. Some time ago it acquired several new and specially designed aircraft and these have repeatedly demonstrated their value in connection with rescue work at sea. However, this type of work is only a part of that which is required of the Coast Guard. It must prevent smuggling, enforce customs laws, protect fisheries in Alaska, maintain ice patrols in the North Atlantic, and render many other services in which the airplane could well be used. Secretary Morgenthau has shown his recognition of this by initiating an expanded program for aviation.

McLaughlin Aerial Surveys, Inc.

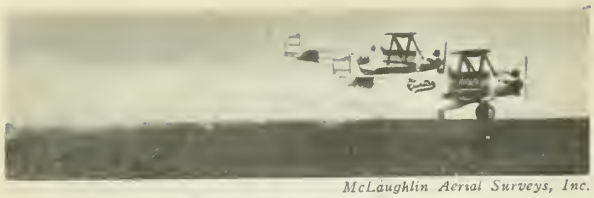
Due to the special nature of its work, it might be advantageous for the Coast Guard to establish an aviation course as a part of the curriculum at its academy at New London, Conn., where its pilots could be trained for the particular types of conditions under which they will be required to operate.

Then in the Customs Service many uses may be found for the airplane in the prevention of smuggling and in investigative work where speed is of paramount importance.

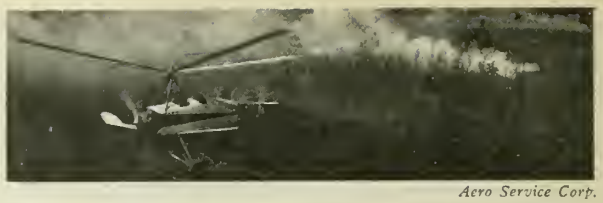
The Public Health Service makes some use of airplanes in the transportation of injured government employees, and probably could use them to a much larger extent in making surveys of sanitary conditions, and in disease suppression work.

Local interest would be stimulated and this country's national defense program would benefit if the War Department were to expand the number of National Guard squadrons so that each state would have its own militia air service.

The Bureau of Air Commerce of the Commerce Department maintains a vast communications network for civilian avi-



McLaughlin Aerial Surveys, Inc.



Aero Service Corp.

Left: Crop dusting by plane covers large areas in comparatively little time. Right: Aircraft are successfully utilized in spotting and preventing the spread of forest fires in many sections of the country

ation purposes that would be taken over by the War Department in the event of a national emergency. The communications sections of the Air Corps and Signal Corps of the War Department could prepare themselves for future emergencies by maintaining closer liaison with the Air Navigation Division of the Bureau of Air Commerce which operates this network.

Interest in aviation in the insular possessions of the United States would be stimulated through the organization of squadrons by the Bureau of Insular Affairs of the War Department in each of the possessions under its jurisdiction.

The airplane's place in the Forest Service of the Department of Agriculture is well known. It has been of considerable value in forest planning, mapping, timber and range survey, fire control and emergency transportation, and it may be possible to expand this use even more.

Aerial surveys should prove valuable to the Bureau of Public Roads in determining routes; to the Biological Survey in its conservation of wild life; to the Bureau of Agricultural Economics in making surveys; and to the Bureau of Agricultural Engineering in its studies to aid in controlling drainage and soil erosion, and in its irrigation work, where aerial photographs should give in a very short time information that might take months to acquire by land surveys.

In this connection it may be mentioned that the Soil Erosion Service of the Department of the Interior is now having 25,000 square miles of territory photographed from the air, using a special four-couple camera. The National Park Service is also utilizing aerial photography to study locations.

In connection with a social census, which many think is most desirable so far as the future is concerned, aerial photographs would doubtless prove of great value to the Bureau of the Census of the Commerce Department.

The Agricultural Adjustment Administration could very well use aerial maps to determine more accurately acreage which can not be accomplished quickly in any other way.

The Bureau of Lighthouses of this department has eight districts on the east coast, two on the west coast, three on the Great Lakes, one at St. Louis, and in addition there are districts at Puerto Rico, Alaska and Hawaii. These districts maintain 22,495 light stations, lightships, radio beacons, buoys and other facilities, all of which require regular inspection. According to the latest information available, this bureau also maintains 55 tenders, 47 lightships, 16 major depots and 28 sub-depots.

All of these facilities must be inspected regularly. With present methods inspections are made by boat. By using seaplanes where possible for the inspections a greater number could be made in a shorter period of time and the boats could be freed for other work. Comparing the $350,000 initial cost for one of the Bureau's 170-foot boats, with a $25,000 seaplane, and a yearly operating cost of between $40,000 and $50,000 for the boat as against a small fraction of that for the plane, the money saving is obvious. However, the full cost for the Bureau's boats can not be charged to inspection work alone as they also are used for transporting supplies, for making repairs and other general purposes. But the savings in inspection costs and the increased efficiency resulting would doubtless be more than enough to justify the use of aircraft.

There is a possibility that the airplane might have some use in the Bureau of Navigation and Steamboat Inspection for transporting employees in its enforcement and inspection activities.

In the Coast and Geodetic Survey there is no question of the value of the airplane in survey and map making work. This Bureau is now employing a five-lens camera to speed up its work as well as reduce the cost per map mile. Arrangements are now being made to turn over one of the Air Navigation Division's airplanes to the Survey for trial in making aerial photographs along the coast line.

The Bureau of Fisheries should find

(*Continued on page 66*)

A bend in the Mississippi River photographed for the purpose of studying the path of the river and flood control in that region

McLaughlin Aerial Surveys, photo.

AIR
Hot and Otherwise

Trial By Error

●

FRANK A. TICHENOR

● The New Dealers have some strange ideas about how the American Constitution and American ideals can be twisted into new interpretations. You may think some of them all right, or you may think the whole New Deal is just a slick political shuffle. But there's one increasingly prevalent practice of the Administration which no real American, no one with a sense of justice and fair play, can approve of. That is this ugly, thoroughly reprehensible business of convicting people before they're proved guilty.

The first victims of this modern inquisition were the air mail contractors. The latest victim is Major General Benjamin Foulois, Chief of the Army Air Corps. Both were fed to the lions to make a politicians' holiday. Both were condemned without a hearing. Both were slandered as public enemies.

It matters not whether General Foulois is really innocent or guilty. Knowing his loyalty, integrity and intelligence in the past, we have faith that he is innocent. But we don't know. No man knows. No man *can* know until he is given a fair and open trial.

That is a fundamental premise of American justice. It involves everything that this country stands for, everything that it has fought and bled for, everything that it represents to its citizens and to the outside world—fair play. Woe to this great nation if we ever let politicians destroy that ideal.

Showing Up the Politicians

But make no mistake about it—politicians of the Farley-Rogers stamp are threatening that ideal RIGHT NOW.

Their method is cunning and cruel. Whoever incurs their wrath is crucified on the cross of special privilege. They know how to use mob psychology to attain their nefarious ends. The procedure is simple—they choose their victim, point the finger of guilt and start shouting "intrenched interests," "special privilege," "playing favorites," "collusion" and a hundred other epithets calculated to convince the public that, ah, here is another of those dirty dogs who have been raiding the forgotten man's pockets!

Un-American though it is, this method usually works, because, after five long years of depression, the public is looking for someone to blame for its troubles. In the case of the air mail contractors, however, Farley and his ilk got fooled. Public opinion back-fired on them. The Government's miserable attempt to carry the mail itself made a farce of all the slurs and accusations. "How," the public wanted to know, "could the civil air mail system be so corrupt when it was obviously the swiftest, surest and most efficient of its kind in the whole world?"

The master politician couldn't answer that one. Then the public went further and started asking, "Why were the air mail operators convicted without a hearing?" The ex-Tammany strategist realized he was about to be caught in his own trap. He backtracked, and returned the air mail to the private carriers, but not without hurling a few more verbal brick bats during his retreat.

But did that end the matter? Oh, no! The politicians had to cover up their tracks. The public was obviously restless about the status of its air defense arm. There were underground rumblings as a result of the Air Corps' unfortunate showing while carrying the mail. The planes seemed inefficient, the pilots inexperienced. The public wanted to know why. Certain dangerous explanations (dangerous to the politicians, that is) were bubbling up close to the surface, about to erupt in a geyser of scalding water. The air was pungent with steaming rumors—the Air Corps had been stinted; it had been denied sufficient funds to buy efficient equipment or adequate flying time for its pilots; Congressmen had been seen trooping in and out of the General Staff and Air Corps offices on mysterious missions; some New Deal appointee had been tampering with the specifications for bids on new planes, writing down the performance requirements below the standards of any other air power; the exponents of old-line military tactics were gagging the Air Corps and shoving it off into the corner.

Something had to be done—and done quickly—to save the political day! Find a victim. Throw him into the boiling cauldron. That will keep the geyser from erupting, just as a potato dropped into a bubbling pot stops the water from boiling.

Let's Have a Victim!

General Foulois would make a perfect victim. He's handy. He's prominent. It was his Air Corps that fumbled the air mail ball. It was he who had charge of procurement and training. Great! Blame *everything* on him. Gather the cohorts of ballyhoo and blow on the trumpets—until the public is convinced that the culprit has been found. Then throw him into the dungeon and forget about him.

Figuratively speaking, that apparently is just about what has happened to the Chief of the Air Corps. Through the Rogers sub-committee of the House Military Affairs Committee, he was slurred as being incompetent, inefficient, dishonest and neglectful of his duty. The press was flooded with accusations breaking the backbone of his reputation. The result has been that, in the public mind, he stands convicted. So the politicians are satisfied. They are willing to let the matter drop. They've covered their tracks. Why worry about justice or fair play?

It is this sort of scheming that is dangerous to American institutions and ideals. If General Foulois is suspected of being guilty, he should be given a fair hearing. There is nothing so mean and cowardly as to besmirch a man's character and then walk off leaving him in a position where he cannot reply. Yet that is what they apparently are doing to General Foulois. He is a soldier; he cannot defend his conduct except at a duly specified time and place. They have convicted him in the eyes of the public. Now they have nonchalantly strolled away and forgotten him.

By their tactics, they jeopardize the whole principle of the American judiciary system. No longer, apparently, do we have trial by jury. No, we have trial by error.

EDITORIALS

"There has been a general tendency in recent years to increase air armaments throughout the world, and there is a general trend toward the adoption of a definite air strategy wherein aircraft is contemplated as a primary offensive arm. In the United Kingdom, our new program will raise the number of machines from 844 to 1,304 if the program as I detailed it to the House is carried out in its entirety to the term of five years."—STANLEY BALDWIN, Acting Prime Minister of England.

The National Air Races

● We can look back with fond recollection to the time when all branches of the industry turned out for the aircraft shows and air races that became frequent affairs during the "flying season."

Since that period, much has transpired, and only a few companies remain where once there were many. Despite this, the remaining portion of industry has plodded on to achieve such technical progress that the term "flying season," as we knew it then, no longer exists.

Annual aircraft shows have been lost in the natural desire to conserve expenses and eliminate costly exhibitions, yet continuing as though nothing has happened, is the extravaganza known as the National Air Races.

This year, from the 31st of August to the 3rd of September, the atmosphere around the Cleveland Municipal Airport will pulsate to the vibrations set up by specially-designed speedy aircraft as they fly from pylon to pylon in quest of greater speed and racing glory. It is one of the few events left to remind us that aviation has not passed away with the "good old days," but is here to stay and to rise to even greater heights from year to year.

The proving ground for products of aeronautical engineering genius and the development station for unproven advancements that soon will become part of our everyday aeronautical life, the National Air Races are worthy of substantial encouragement.

Regulations for the Airlines

● The new regulations adopted at the conference between the airline operators and the Bureau of Air Commerce offer the operators an opportunity of making air transportation the safest as well as the fastest medium of travel. These newly-formulated rules should be instrumental in bringing the air transport business to a high point in transportation efficiency. Not only will they promote the efficiency of the vast airline system in the United States, but they also will increase the safety of flight in scheduled operations.

Paramount was the desire to make air transportation and the airliner safer than any other form of travel. Restrictions were placed on single-engined planes while operations of multi-engined craft were allowed more latitude if the craft demonstrated its ability to operate safely, although not as efficiently, with one of the engines out of commission.

Recognition was made of the great advancement in speed, range and dependability of the modern airliner, allowing them to operate over bad weather areas and to fly distances that would have been considered an impossible handicap to safe flying only a few years ago.

Further evidence of the desire to increase safety is seen in the rules calling for treatment of routes by the division method, with pilots and planes adapted to particular terrain and operating over no other route; the periodic demonstration by pilots of their ability to fly blind and navigate by radio beacons and the move to require the licensing of all airline dispatchers.

The sensible and diplomatic manner in which these rules were presented and approved by both sides indicates that the airline operators appreciate the necessity for continuing to give first consideration to the safety of their passengers.

Overnight Flight From Coast to Coast

● One of the industry's fondest dreams was realized last month when the continent was spanned by a regularly scheduled overnight passenger service between cities on the Atlantic and Pacific coasts. Bringing Los Angeles and New York within 18 hours of one another is the beginning of a more intensive trade and travel activity between coast cities, for it is now possible to have an early dinner in New York or Los Angeles and then on the following morning enjoy breakfast in a city 3,000 miles away. Evidencing the speed offered, copies of AERO DIGEST published in New York on August first were delivered in Los Angeles on the following morning.

An interesting feature associated with this service is the casual manner with which transcontinental passengers depart from and arrive at the air terminals. There is no appearance of haste or confusion on the part of passengers or personnel. Even when the ship has taken off, the pilot leisurely circles the field, gaining altitude before heading for the coast. It is difficult for observers to realize fully that TWA's Douglas transport will land its eighteen passengers on the opposite coast within 18 hours including three stops for fuel en route, yet this daily routine is carried out with precision.

Luxurious transportation at high altitudes in fast comfortable, sound-proofed airplanes with controlled ventilation seems to be the answer to modern travellers' demands. And the manufacturers and operators remind us that today's equipment and fast schedules are but another forward step in the march of air travel progress.

Advancement Of Invention

● If there is one place where the history of the aspirations and achievements of the inventive genius on which America peculiarly prides itself is summarized, it is in the U. S. Patent Office. At the World's Fair of 1934 at Chicago, the Patent Office, in its exhibit in the U. S. Government Building, surveys the American record of inventiveness.

In the number of patents issued the United States has the figures to back its claims. Since the organization of our federal government 1,897,932 patents have been issued by the Patent Office up to January 1, 1934. Nearest to this record is France with 871,532. Great Britain has 797,153, Germany 583,728, and Italy 273,598. Canada rates high in inventiveness in proportion to population, with a total of 325,800 patents issued. Japan since its modernization has issued 83,361 patents and the U. S. S. R. has issued 63,992.

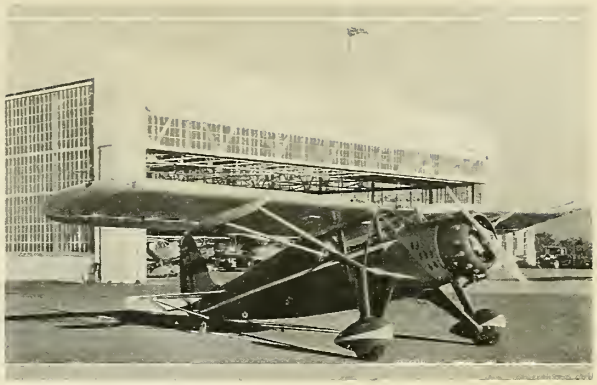
Among the states last year, New York led with 8,017 patents issued. Illinois was next with 4,923. Ohio and Pennsylvania almost tied for third honors with 3,880 and 3,876 respectively. The north-temperate zone atmosphere seems most favorable to the labors of inventors, as Mississippi is on the list with 49 patents for the year, while Louisiana and Georgia have 141 each.

Millions of patents issued, millions of dollars and millions of days of labor expended on working models. The inventor is a scientist and prophet combined. Without him the industrial world would remain static.

The Ideal Aircraft Dealer

from the viewpoint of a manufacturer

H. EICHHAMMER
Fairchild Airplane Sales Corp.



The attractive sales hangar of the Pacific Aircraft Sales Co., Los Angeles, showing the neat surroundings at the field. The ship is ordinarily on display in the front right hand corner and the sales office may be seen at the extension of the hangar, behind the 145 h.p. Super Scarab-powered Fairchild 24

● The gradual, but definitely noticeable, improvement in general business conditions during the past year has resulted in a sudden upturn in the private owner aircraft market. Practically all of the major aircraft manufacturers are not only working full blast up to absolute code limits, but actually have found it difficult to bring deliveries to within shouting distance of the demand. Delays of thirty to sixty days have been the rule rather than the exception.

Especially pleasing is the fact that the greater percentage of sales is in the higher priced fields—ships selling between $4,000 and $8,000. Prospects who have been on the proverbial "fence" for many months are buying this year. B. D. DeWeese, president of the Stinson Aircraft Company, reports sales of approximately $500,000 for the first six months of 1934; a 300 per cent increase over 1933. The Waco Aircraft Company exceeded its 1933 total as early as April. All Fairchild deliveries are far behind orders despite capacity production of 20 planes monthly. Other companies report similar growth, an outlook that is most encouraging, especially for dealers who have the business initiative to adopt sound and proven merchandising methods in the disposal of airplanes.

Unfortunately, there are still a great many aircraft dealers, who, despite the franchise granted them by manufacturers, do not fill the role as the essential merchandising link between the builder and the buyer. Less than 10 per cent of them are on par with the average automobile dealer. The depression has, of course, practically eliminated that group which had no stock in trade but the ability to fly an airplane. A few managed to survive the last three years by a meager income derived from student training. Most of them, however, have finally learned that a haphazard demonstration of their own stunting skill was not making sales. They have, therefore, been forced out of the picture.

During the lean years, most sales were made direct by the manufacturing companies through field representatives. This method of direct selling was neither desirable nor efficient. The manufacturer's representative was forced to scour vast areas to find the few ready-made prospects who existed. A representative of a well-known company made no less than six zigzagging trips from coast-to-coast during six months. Others have been forced to similar expensive distribution methods. Inasmuch as an airplane sale is usually a combination of many factors —advertising, direct mail, correspondence, telegrams, demonstrations, procrastination, actual flight instruction, etc., —a tremendous amount of effort was wasted because the field representative could not remain in constant touch with prospects. Even more unfortunate was the fact that no satisfactory local service could be arranged for the purchaser in many instances. This is, by its very nature, a distinct dealer obligation—an obligation that the manufacturer cannot conceivably handle satisfactorily.

It is obvious that direct selling of the popular types of aircraft has no more permanent place in the aircraft industry than it has in the automobile or motorboat field. Though it was done extensively in the last three years, the trend was a matter of necessity, not of choice. The time for its elimination has arrived. Most manufacturers are ready for it now, and will gladly turn over the distribution of their planes to competent dealers, paying them well for their efforts. All we need now are enough competent dealers.

Any person familiar with basic merchandising psychology can appreciate the vast difference between the stage-setting of a $4000 to $8000 airplane set-up and the $500 to $800 automobile dealer's establishment. The auto dealer has brand-new, shiny models on display in a carpeted showroom. Neatly framed photographs pictorialize other models. Large charts point out quality features. Easels contain individual parts for close examination. Side tables contain literature. Exact prices, delivered, are prominently displayed. Comfortable divans invite a longer stay. Above all, intelligent salesmen discuss the respective merits of the product and demonstrate the important features on the highway.

On the other hand, the average airplane dealer is usually in a hangar full of ships. Oil spots on dusty concrete floors have to be carefully avoided. Prospective purchasers squirm around fuselages, bump against tail groups and duck underneath wings. They see the ship in which they are interested—crowded in behind others. There is no perspective, no full view, no suitable lighting. Their hands get dirty from dust. The sales comments are unintelligent and general, and would apply almost equally well to any plane, vacuum cleaner or fly-swatter. After much effort and waiting, the ship is finally available for demonstration—just as soon as it is gassed and oiled. The "demonstration" ride is disconcerting, alarming, and proves only that the dealer is a good pilot. Price? "So much at the factory, and about so much to get it. Might even allow some discount on it. That competitive make? Just a pile of junk! Well, let me know when you're ready."

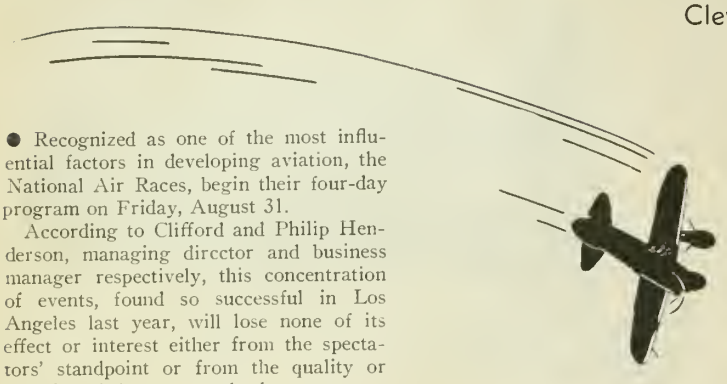
This picture may seem a trifle exaggerated, yet every detail has been observed dozens of times. Obviously the prospective buyer is still as far, if not farther, away from closing as ever. Is there any wonder he isn't sold?

In describing the kind of a dealer desired by the aircraft manufacturer it is necessary to picture the idealistic set-up, the ultimate goal which the true dealer should plan for himself. During the early stages of his franchise, it will undoubtedly be necessary to be governed by various financial handicaps, but, unless

(Continued on page 66)

Program of the National Air Races

Cleveland, Ohio, August 31-September 3



● Recognized as one of the most influential factors in developing aviation, the National Air Races, begin their four-day program on Friday, August 31.

According to Clifford and Philip Henderson, managing director and business manager respectively, this concentration of events, found so successful in Los Angeles last year, will lose none of its effect or interest either from the spectators' standpoint or from the quality or quantity of the races and other events on the program being unfurled at the Municipal Airport in Cleveland.

A total minimum cash prize purse of $35,000 and many valuable trophies are being awarded to the winners of various events, with the Thompson Trophy race on Labor Day, the last day of the races, taking a ranking place in importance by reason of its large cash prize of $10,000 and because of the possibility of the setting of a new world's landplane speed record. The Bendix Transcontinental Speed Dash also is attracting considerable attention, not only because there is to be $10,000 divided among the winners of the first five places, but also because an additional $2,500 is at stake for the pilot who sets a new transcontinental speed record between Los Angeles and New York. Another series of events which are creating interest in racing circles are the Shell Speed Dashes and the free-for-all races sponsored by Louis William Greve. Mr. Greve is sponsoring three races for the 550 cu. in. group and will award the Louis William Greve Trophy to the pilot who, while using the same plane, has accumulated the greatest number of points during the three races. The award will be made on the point basis with five points for first place; 4 points for second; 3 points for third; 2 points for fourth and 1 point for fifth. In addition a total cash purse of $5,100 will be awarded in these events.

Shell Speed Dashes will be open to men pilots only who will be competing for a total purse of $5,000 and three Shell Trophies to be divided as follows: Group 1—$1,000 for engines of 375 cu. in., displacement or less. Group 2—$1,500 for engines of 550 cu. in., displacement or less and Group 3—$2,500 for engines of unlimited cu. in. displacement.

There will be five prizes for each event, to be awarded as follows: 45 per cent for first place; 25 per cent for second place; 15 per cent for third place; 10 per cent for fourth place and 5 per cent for fifth.

This being the 25th anniversary of the world's first air race, held at Rheims, France, the feature of which was the Gordon Bennett Trophy Race won by Glenn Curtiss, the theme of the 1934 National Air Races will be "A Quarter Century of Aviation Progress." It was also 25 years ago that Louis Bleriot made the first crossing by air of the English Channel and that the United States government awarded its first contract to the Wright Brothers for its first contract military airplane. To commemorate this occasion, it is planned to have as many of the old-time planes as it is possible to secure and put in condition for flight, to make exhibition flights each day of the program.

Greater Army, Navy and Marine Corps participation than in past years has been accomplished for this year's show, and there is foreign representation by Ft. Lieut. R. L. R. Atcherly and Gerd Achgelis, European aerobat, who will vie with Milo Burcham of Muncie, Ind. Burcham is present holder of the inverted flight record, and it is understood he now is looking into the possibilities of a transcontinental inverted flight soon after the Cleveland show.

Nightly shows are being sponsored by the Standard Oil of Ohio, with fireworks, a "comet" plane and numerous features already arranged. One nightly feature will be a parade of automobiles manufactured prior to 1909.

The Navy is sending its "Sea Hawks" from San Diego for the show, the Army is sending the First Pursuit Group from Selfridge Field and the "Three Musketeers" from Maxwell Field, while the Marine Corps is sending two complete squadrons from Quantico.

The Bendix transcontinental has attracted Roscoe Turner, Lee Gehlbach, Wiley Post, Walter Wedell, Jimmy Haizlip, Jim Granger, Lieut. Murray B. Dilley, Jr., Benny Howard and "Oskosh" Wittman; some are flying newly designed ships.

Prizes for the Thompson Trophy Race have been increased from $5,000 to $10,000, in the nature of a memorial to the late Charles E. Thompson.

Among those competing in the speed dashes are Art Chester, Lee Miles, Ben Howard, Gordon Israel, J. J. Wittman, Harold Neumann and others.

The tentative daily lineup of events and prizes follow:

Friday, August 31

375-inch free-for-all, Firestone Speed Dash; 50 miles, 10 laps of the five-mile course; qualifying speed, 175 m.p.h.	$1,400
375-inch, Shell Speed Dash; Group I	1,000
550-inch free-for-all, L. W. Greve Trophy; 50 miles, 10 laps of the five-mile course; qualifying speed, 200 m.p.h.	1,700
Parachute Jumping Contest	200

Saturday, Sept. 1

200-inch free-for-all; 15 miles, 3 laps over the five-mile course; qualifying speed, 125 m.p.h.	$400
375-inch free-for-all, Firestone Speed Dash; 50 miles, 10 laps of the five-mile course; qualifying speed, 175 m.p.h.	1,400
550-inch, Shell Speed Dash (100 Kilometers) Group II	1,500
550-inch free-for-all, L. W. Greve Trophy; 50 miles, 10 laps of the five-mile course, qualifying speed, 200 m.p.h.	1,700
Parachute Jumping Contest	200

Sunday, Sept. 2

200-inch free-for-all; 15 miles, 3 laps over the five-mile course; qualifying speed, 125 m.p.h.	$400
550-inch free-for-all, L. W. Greve Trophy; 50 miles, 10 laps of the five-mile course, qualifying speed, 200 m.p.h.	1,700
Unlimited 100-kilometer, Shell Speed Dash Group III	
1000-inch free-for-all; 50 miles, 10 laps of the five-mile course, qualifying speed, 200 m.p.h.	1,700
Parachute Jumping Contest	200

Monday, Sept. 3

375-inch free-for-all, Firestone Race; 50 miles, 10 laps of the five-mile course, qualifying speed, 175 m.p.h.	$1,400
Unlimited 100-kilometer, Shell Speed Dash Group III	2,500
Unlimited free-for-all, Thompson Trophy Race; 100 miles, 20 laps over the five-mile course, qualifying speed, 225 m.p.h.	10,000
Parachute Jumping Contest	200

A Junketer Rides the Airways

CY CALDWELL

● Junketing around and about at the taxpayers' expense has become one of the most fashionable of outdoor sports, and now rates as a national pastime. If any tired Democrat wants to go some place for a change he merely indicates to the ruling dynasty in Washington that this, that, or the other thing needs investigating; and straightway a commission is appointed with the aspiring vacationist as Chairman. A plethoric expense account is voted for the junket, cameras click, reporters query, and in a moment the happy junketer is off on a merry gallop around the country. If he finds out anything, he writes it down. But if he finds out nothing, it doesn't matter; for even if he found out something and wrote it down nobody would read it anyhow.

As a patient taxpayer I've read about these various junkets with more or less patience. But when I learned that even my dear old friend Ed Warner, late Assistant Secretary of the Navy, had been dragged out of obscurity and sent careering around at the taxpayers' expense, I decided that the time had come for me to gird up my loins and go some place for nothing in particular, which is what all of these governmental commissions actually go for. Even if I found out nothing to write about, I'd still be junketing neck and neck with the rest of them, so how could I lose?

But the trouble is that I'm not a Democrat in good standing, and therefore have no crow-bar with which to pry loose a wad of jack from the perspiring taxpayer. I either must pay my fare or use my wits to travel free. It occurred to me that a story on the airlines might rate a pass from the lords of the air, so I mentioned the matter in a letter to Bob Johnson of United Air Lines. I admitted that none of my six readers were likely to become airline cash customers until they'd saved up their government dole for a number of years, as right now when they travel anywhere they did it by standing on the roadside and indicating the desired direction with their thumbs.

However, Bob must have considered an audience of six old thumbers worth while, for along came the pass. On the back was printed: "This pass is secondary to the rights of regular passengers." Calling it "secondary" was putting it mildly. I caught the first flossy limousine leaving New York for Newark Airport and stepped up to the ticket window to get the last available seat on the 9 o'clock plane for Chicago which I had learned by telephone was open. It closed immediately, for a cash customer stepped up and paid for it. That left me waiting for the 10 o'clock, which rolled up and rolled right out again packed to the roof with happy passengers who had paid to get aboard. Thereafter, on the hour, large self-satisfied looking Boeing 247's passed me by with their noses in the air and their fuselages filled with air-minded passengers, all of whom had paid to get aboard. By the time the 2 o'clock plane left me I came to the conclusion that all America was patronizing the airlines and that a Form 13 Trip Pass was about as much use as a fur parka in the tropics.

But I hung on. I'm an old hanger-on from away back. I watched policemen deterring passengers who wanted to get aboard and for whom there was no room. Even people with money were waiting for the next plane. In my hand I clutched a strip map to Chicago, but apparently all I needed was a map of Newark.

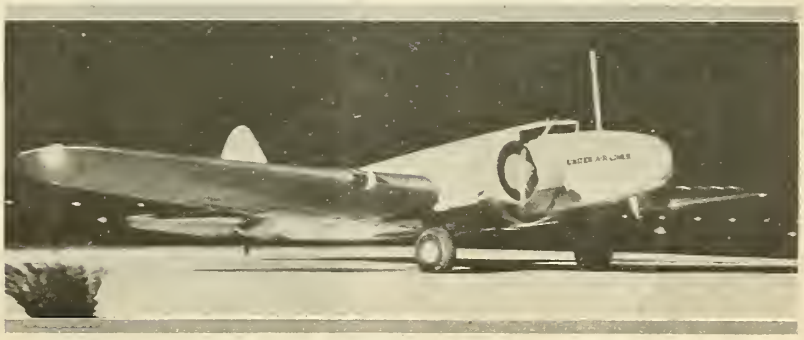
The Man with Form 13

By this time everyone around the terminal knew me as The Man With Form 13; I became something of a character about the place, and attendants pointed me out to departing passengers as the oldest inhabitant in those parts. On the pass it said, "No. 37807." That evidently meant that there were 37806 other prospective passengers still ahead of me in Newark. I simply had to wait until a paying passenger broke his leg, so I took a taxi to a bar situated on the edge of the airport, a sort of oasis in the Newark desert. Imagine my surprise on my return to learn that there was a seat on the 4 o'clock plane; you could have knocked me over with a copy of the Congressional Record. I collapsed like an undercarriage on a Dick Blythe landing. When I regained consciousness I was in the air and a kindly stewardess was adjusting my chair and placing a pillow beneath my head.

My maps, I discovered upon looking out, were about as much use to me as a seating plan of Radio City would be to a lost explorer in Africa. The pilot was flying on the radio beam, and I was flying on faith, hope, and charity. Below us the clouds were thick and white like a layer of absorbent cotton, and another layer was a few thousand feet above us. We were in between, like a piece of boloney between two slices of white bread. There was no more sense of movement than there is in the N.A.A. We were away from the earth in a soft white world of restful beauty, with the Wasp motors humming along like giant insects and with no other sound but the gentle swish of soup which the passengers were inhaling from paper cups.

In three hours we reached Cleveland, and a minute later I was on the ground; a cash customer had stepped up and bought the seat in which I had been traveling, so I had to get out. Apparently Form 13 was good only in waiting rooms and it would take me years to get to San Francisco. I called up Harold Crary of United and learned that the boys had been having fun with me: this Form 13 was just a little joke they played on people from time to time. It looked like a pass, but wasn't. If there was a vacant seat you could have it; but there never was a vacant seat out of New York. It seems I had only got from New York to Cleveland by mistake; a lady decided at the last minute to have her baby born in

(*Continued on page* 68)



". . . on the hour, large self satisfied Boeings passed me by with their noses in the air . . ."

Personalities

by Caldwell

● CAPTAIN ALBERT W. STEVENS, U. S. Army Air Corps, was born at Belfast, Maine, March 13, 1886, and descended by parachute at Holdredge, Nebraska, shortly before 5 p.m. July 28, 1934, followed immediately afterward by the wreckage of the stratosphere balloon *Traveler*. Between those important dates Captain Stevens has led an interesting and exciting life. He has encountered many dangers, endured many hardships at high altitudes and in distant lands, but he has evaded the world's sternest test of man's powers of endurance and patience —he is still a bachelor. And although he has dropped from 60,000 feet altitude suspended beneath a large balloon with a big rough hole in it, he has never experienced the nervous apprehension which grips the average husband who staggers into his stern wife's range of vision at about 3 a.m. with the weak explanation that he was detained at the office or was sitting up with a sick friend.

It was three years ago this summer that I met Capt. Stevens at Wilbur Wright Field, Dayton. It was a hot Sunday, and the only thing more deadly than a hot Sunday in Dayton is another hot one in Philadelphia. The only people in Dayton who didn't try to get out of it that day were a few grimly determined church members and the inhabitants of Dayton cemeteries. And Capt. Stevens. He was there, developing photographs at Wilbur Wright. Six working days weren't enough for him—he also toiled on the seventh. If he's ever had a vacation there's no record of it. I fear that he has worked all his life, and as his life is his work, he's always interested in it, and always working. That's what saved him from matrimony, so you see there are some compensations for always working.

As Wilbur Wright was closed up I had a slight difficulty in effecting an entrance. But when I explained to a suspicious guard that I was visiting Capt. Stevens I was admitted at once, for the guard knew that Capt. Stevens could only be found at that one place. When I appeared, Stevens got out a large gallon jug marked plainly DEVELOPING FLUID, and filled two glasses. We proceeded to develop ourselves rapidly. If someone had made a print of us several hours later it probably would have been a blur. I recall looking over the collection of airplanes and engines they have at Wilbur Wright, both in the experimental and in the museum department. Sometimes you couldn't tell by looking at the object which department it had been purchased for; they had fighters and bombers on trial for the Army that I'd have put into the museum, myself, without further experiment, or without any experimental flights whatever. In fact, even now the Army is flying many airplanes that should be in museums. But that isn't the Army's fault, as you very well know.

That visit was three years ago, but I still recall it with pleasure. Fortunately I took a few notes, in a very wavering and uncertain pencilled script, some of which today is entirely illegible: it was entirely illegible even at the moment when it was written, though I didn't suspect it. But enough is clear to inform me that Capt. Stevens graduated from the University of Maine in 1907 and had the degree of Master of Science conferred on him in 1909, which meant that he was completely packed with scientific information and that thereafter nothing else in the way of information could be got into him even with a pressure pump. Packed with information, he spent the years between and including most of 1914 and 1917 in electrical engineering, gold dredging and mining in Alaska and Idaho. In 1914 he went to Alaska and installed a power plant. He spent 45 days crossing Alaska by dog team, from Nome to the Yukon River, and across the Alaskan range to the seacoast. On one section of this trip they ran out of food and he got as hungry as an actor on Broadway. Then he went to Idaho, returning to Alaska in April, 1917. He was on the trail when the United States entered the war that was to add so lavishly to the casualties and discontent of an already discontented world. When Capt. Stevens, who was then just plain A. W. Stevens, got word of the war he got a husky dog team and drove 50 miles a day toward what is ironically called civilization, took a ship for Seattle, and enlisted in the Great Cause.

None other than A. W. Stevens

He attended Cornell Ground School at Ithaca, went to France in June, 1918, by which time practically everyone was sick of the war, and joined the 88th Observation Squadron as an Air Observer. He had been interested for years in photography so was a useful member of the photographic section, knowing a good deal about it in advance. He took a series of obliques of the entire length of the Vesle River, took obliques of Château-Thierry, St. Mihiel, the Argonne, Meuse, Verdun, and other sectors. At one place the Germans had concealed a machine gun which was wiping up Americans who would have preferred to return to their jobs with the A & P, the National City Bank, and other patriotic American institutions. Capt. Stevens took a photograph of this gun position, the gun was wiped out by our artillery, and at the end of the war many Americans who might have been shot by it were able to return to the states to starve to death, instead of dying quickly and almost painlessly at the front. This was Capt.

(*Continued on following page*)

Overnight.. NEW YORK to LOS ANGELES

via

TWA

in Luxurious DOUGLAS AIRLINERS powered by WRIGHT CYCLONES

On August 1, 1934, Transcontinental & Western Air, "The Lindbergh Line," inaugurated an overnight service between New York and Los Angeles—the first dusk-to-dawn daily transport schedules between the Atlantic and Pacific Oceans. Here are the new TWA transcontinental schedules:

	Leave New York	*Arrive Los Angeles*
West Bound	4:00 P.M.	7:00 A.M.
	5:30 P.M.	9:25 A.M.
	Leave Los Angeles	*Arrive New York*
East Bound	4:00 P.M.	10:55 A.M.
	9:00 P.M.	4:57 P.M.

The new TWA Douglas Airliners, powered by two Wright Cyclone Engines, which develop a total of 1430 horsepower, have a high speed of 217 miles per hour at 8000 feet altitude. Their luxurious comfort, quietness, speed and dependability are the result of two years of intensive development. Forty-one of these super-speed transports, all powered by Wright Cyclones, will be in service operation on TWA before the end of 1934.

TWA's Technical Staff selected Wright Cyclones after the most rigid service tests in aeronautical history. One of the outstanding tests involved a single-engine take-off with a full load of 17,500 lbs., from Winslow, Arizona (4500 feet above sea level). On this test, the pilot deliberately shut off one engine when the plane had traveled 2200 feet down the runway. The plane continued its take-off and climbed to an altitude of 9000 feet, where the pilot leveled off and flew over the Continental Divide to Albuquerque, New Mexico—240 miles distant. A speed of 120 m.p.h. was maintained throughout the flight on this single engine.

WRIGHT

AERONAUTICAL CORPORATION

PATERSON NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

(*Continued from preceding page*)

Stevens' chief contribution to the war.

After the war he did aerial mapping for the Coast Guard and the Geodetic Survey and then in July, 1924, joined the Alexander Hamilton Rice Scientific Expedition to photograph the Orinoco River country in Brazil, and which was chiefly remarkable for starting Walter Hinton off on his road to fame as a correspondence school impresario.

Capt. Stevens became a Captain in the regular Army in July, 1920, dropped back to Lieut. in the reorganized Army in 1922, and was again made a Captain in 1925, which rank he has clung to since. He wanders all over the globe taking pictures. Three years ago he went to South America and photographed the Andes from the air, writing his experiences in the National Geographic Magazine, with illustrations which he had taken himself.

Many inventions in the photographic world are credited to Capt. Stevens. He perfected the antomatic flashlight bomb, and in-between-the lens shutter for altitude and distance photography, and color filters. He has photographed mountains from 300 miles away, and has refrained from taking a picture of Mrs. Roosevelt, which is the thing I admire him for most. One time he took a photo of former president Hoover, and survived the strain. He's very tough. He has done a lot in photography that will help to change the complexion of the next war. For instance, no camouflage of gun positions will be able to fool men like Stevens and their photographic plates; they can take pictures by day or by night and the print will show plainly just what is what. In the next war a gun position, no matter how they camouflage it, will be about as conspicuous as a goldfish in a Woolworth store window. He lives at Wilbur Wright Field, has an ice box and a mattress on a table, sleeps, gets up, works, takes a shower, sleeps, works, goes on expeditions, and so on, and on, and on. . . .

Dick Depew

● DICK DEPEW, was born at Plainfield, N. J., May 20, 1892, and has lived for 42 cautious years. So far as I can see, he'll live for 42 more—all cautious. Compared to Dick, such careful old pilots as Walter Lees and myself are mere thoughtless dare-devils. "Old Mother Depew," the more daring boys always called him; but he's still here, after all his flying, and many who laughed at his caution passed on in a hurry. So there you are. He is another of that extremely brief list of pilots with whom I would fly anywhere, at any time, knowing that I'd either get there safely or I wouldn't even start. I know of only one occasion when the old boy got fooled, and that was back in what he refers to as his youth, though I think that he was born old. He started off one time from New York for Cleveland, and I don't know what mad fit of daring overcame his usual caution, but the fact remains that he and a passenger flew above the clouds, couldn't find the ground, and decided to jump rather than feel their way to earth in fog and rain.

Out they went, parachuted through the clouds, and lit on a mountain in Pennsylvania. So did the airplane, not far away from them. Some farmer called up an undertaker and told him that two aviators had been killed at a certain spot. So while Richard and his passenger were waiting at the wreck, along comes the undertaker from town, complete with hearse and two horses with sable plumes on their collars. Well, ever practical, old Richard hired the hearse to transport him to the nearest railroad; so he and his passenger chucked their parachutes and baggage from the wrecked plane into the hearse, climbed inside, and soon were rattling down the mountain, as unconcerned as a couple of pine coffins. That probably sounds like one of my inventions, but it's true. It couldn't have happened to anyone but Dick Depew, and he guarantees that it won't happen again.

From 1909 to 1911 Dick was a charter member of the Cornell Aero Club, where he built and flew gliders. In 1911 he learned to fly at the Maurice Farman School at Buc, France, and received F.A.I. license 641 from the Aero Club of France, at which time he was the second youngest aviator in the world. He's now about the second oldest, which is either progress or merely disintegration, I don't know which. Between 1911 and 1917 he studied aeronautics while engaged at other occupations, such as washing dishes and thinking, both of which are very wearing. And then, in January, 1917, he joined the engineering department of the Curtiss Aeroplane & Motor Corp. and took additional flying instruction and practice on Curtiss planes. He flew for the U. S. Government at the 2nd Officer's Training Camp, at Plattsburg, and became a flying instructor and test pilot. From July to December, 1918, Richard got very snappy, becoming test pilot for the U. S. Army Air Service, with rank of Captain, at McCook Field, Dayton, Ohio, then the Army's experimental field. Some of the planes Richard had to test would make your hair curl; in fact, that's how he got curly hair.

In January, 1919, the Army stopped feeding and annoying him, upon which he again leaped into the friendly arms of the Curtiss Co., and became manager of the Curtiss School at Mineola, now Roosevelt Field. There he instructed and tested planes until February, 1922, when he became Argentine Manager of Curtiss Export Corp., at Buenos Aires, in charge of all sales and operations and activities of Curtiss in the Argentine. In March, 1923, he returned and joined the Fairchild organization, serving in various capacities until May, 1932. At different times he was chief pilot, manager of flying division, vice-president and director of Flying Corp., sales engineer, and in charge of sales and advertising. After the others went home, he used to sweep up.

From May to August, 1932, he demonstrated Pitcairn autogiros for Giro Transport & Sales Co., and from August 1932 until recently he was vice-president in charge of flying, and manager, of the Aviation Country Club at Hicksville, L.I. The rumor that he was a butler out there is not true, and I'm glad tc deny it; he doesn't even look like a butler —he looks like a chef.

Richard has flown in the last 23 years 105 types of aircraft, including landplanes, seaplanes, flying boats, amphibions, autogiros, and gliders. He has also ridden in elevators and in the subway, which wore him down still further. He has flown in Canada, Mexico, France, Argentina, and over Hoboken, doing exhibition work, passenger flying, aerial photography, and sales demonstrations. He has never, however, engaged in mortal combat over the city of Brooklyn, as two enthusiastic Chinese aviators did recently.

Richard Henry Depew, Jr., to give him his full and dignified name, is now associated with Beckwith Havens and Manola Weichers as Fairchild Distributors for the Districts of New York, New England, and Northern New Jersey. In addition they will also act as Service Representatives for the various Fairchild dealers in their territory. Their headquarters are at Roosevelt Field.

★ ★ ★ ★ FAIRCHILD

Facts! License registrations prove that Fairchild popularity is based on actual sales and deliveries rather than advertising claims. During 1934, Fairchild cabin deliveries have exceeded by a wide margin the combined total of all makes of two-place cabins (excluding "winter enclosure" models) ...while the sales of Fairchild open-cockpit sport and training planes show a dominant leadership among all makes in the thousand pounds upward classifications.

The Four Star Cabin . . .

There's only one way to be sure about the superiority of anything . . . direct comparison. This same method applies to airplanes—especially the Fairchild Cabin. ★ What other plane has every movable part rotating on ball bearings (52 in all); every metal fitting, strut, bracket, truss and rod corrosion-proofed by cadmium plating, baked enameling and anodic treatments; every fuselage tube sand blasted, tested, and coated with weather-proof aluminumized oxide? ★ What other plane will cruise three people at 2 miles per minute, 500 miles in one jump, on 8.5 to 9 gallons . . . or $2.75 per hour? ★ What other plane has such inherent stability that even a novice can stall the ship completely, and make perfect figure eights with the rudder alone, while the stick is held completely back? ★ What other plane combining only the style, beauty, roominess, speed and weight-carrying ability of the Fairchild, has a price anywhere near the cost of this remarkable ship? Why not write for further details . . . or a demonstration appointment . . . and convince yourself before you buy!

Side-by-side, in companionable spring-cushioned ease . . . with a "rumble" seat for a third passenger. Or two can take enough luggage, golf bags, guns and fishing tackle for a month's vacation . . . with enough gas for 500-mile jumps at 120 M.P.H. or better.

COMBINES MORE QUALITY CONSTRUCTION FEATURES THAN ANY OTHER PRIVATE OWNER AIRPLANE IN AMERICA

Fairchild Airplane Sales Corp.

WOODSIDE LONG ISLAND NEW YORK

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

Effect of High Gust Velocities on Transport Design Requirements

T. C. BENNETT

● Recent reports show that unexpectedly high accelerations were developed by an airplane flying through gusty weather in normal attitude. It is reported that a short time ago, Major Jimmie Doolittle while flying across country at a speed of 180 miles per hour in adverse weather, noted accelerometer readings of 5.6g. The effects of this report are quite likely to be widely felt, particularly by the designer of the transport airplane in which class comparatively low load factors are universally accepted.

This acceleration was developed, presumably, by encountering violent vertical currents of air while in normal high speed flight. The effect of such currents is to instantaneously increase the angle of attack of the airplane with no appreciable decrease in forward speed, so that very high wing lift forces are developed.

Within the past few years it has become generally recognized that for most, if not all, classes of airplanes the so-called "gust" condition will furnish the criterion for design strength. That this flight condition has been but recently considered of importance may be attributed chiefly to the steady and substantial increase in both top and cruising speeds of commercial transports. The effect of increased speed makes itself doubly felt since it has been achieved partly by increased horsepower and partly by clean but heavy cantilever construction. The ratio of pay load to gross weight has depreciated considerably with the increase in top speeds so that it may be said that part of the increased speed has been paid for in pay load poundage. This inroad into the available pay load has compelled designers to build more carefully down to limits of design strength, thus eliminating the former important but usually unrecognized "hidden" margin of safety. This factor was made up of the reserve strength of the material combined with a series of conservative design assumptions.

Simultaneously with the reduction in reserve margins of safety have come considerable improvements in the methods and practices of stress analysis. All of these factors, designing closer to the true strength of the materials, more accurately stressed (and consequently somewhat less robust) structures, and the increase in speeds have combined to make the gust condition of flight very important.

The newly proposed Airworthiness Requirements of the Dept. of Commerce require the use of gust conditions in determining the design load factor, combining a 30 ft. per sec. gust with the normal top speed of the airplane, and a 15 ft. per sec. gust with some greater speed which may be called a restricted diving speed.

Because of the above requirements and the generally accepted opinion that gust accelerations in normal flight are low, it is interesting to estimate the velocity of gust encountered by Major Doolittle.

If it be assumed that the airplane has a wing loading of 15 lbs. per sq. ft. and, for convenience, an aspect ratio of 6, it is possible to solve for the value of lift coefficient which will enable the development of the 5.6g at 180 m.p.h. by using the regular lift relationship and equating it to the increase in lift due to the change in angle of attack. This gives

$$gW = C_L S V^2 \text{ or}$$

$$C_L = \frac{g}{V^2}\left(\frac{W}{S}\right) = \frac{4.6 \times 15}{.002558 \times 180^2} = .833$$

Assuming that the change in lift coefficient per degree is .075, the change in angle of attack $= \frac{.833}{.075} = 11.10°$, so that the vertical velocity becomes 264 tan $11.10° = .19619 \times 264 = 51.8$ ft. per sec.

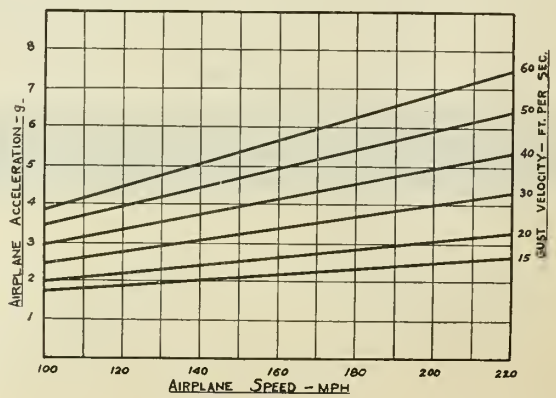
This value of vertical gust velocity has been determined for a wing loading and an aspect ratio which are probably low for a fast modern cantilever monoplane. The effect of increasing the wing loading is to increase the vertical velocity required to develop the acceleration reported. A higher aspect ratio would have an opposite effect, however, so that for purposes of discussion these two quantities may be disregarded.

The gust velocity of 51.8 ft. per sec. should be compared with the required 30 ft. per sec. in the new Dept. of Commerce requirements. As an example, the new requirements have been applied to data taken from one of the newer transports, using for comparison, gusts of 30 and 50 ft. per sec.

The following data are assumed:

Gross weight.....17,500 lb.
Wing loading, W/S.....18.6 lb./sq. ft.
Power loading, W/h.p.....12.3 lb./h.p.
Aspect ratio, R.....7.7
Top speed.....200 miles per hour
Cruising speed.....180 miles per hour
Airfoil .....NACA 2212

From the new requirements, the ulti-



mate design load factor is given by

$$n = 1.5\left[1 + \triangle n\left(\frac{15}{p}\right)^{.435}\right] \text{ where}$$

$\triangle n = m(U/V)$ (q/s)

Correcting to an aspect ratio of 7.7 for the 2212 airfoil

$$m_{7.7} = m_6\left(\frac{4}{3 + 6/7.7}\right)$$

$$= 4.3\left(\frac{4}{3 + 6/7.7}\right) = 4.55$$

so that

$$\triangle n = 4.55 \times \frac{30}{264} \times \frac{.00119 \times 264^2}{18.6}$$

$= 2.305$ and the load factor required

$$\triangle n = 1.5\left[1 + 2.305 \times \left(\frac{15}{12.3}\right)^{.435}\right]$$

$= 5.25$

This is the ultimate design load factor in this case and is less than the developed acceleration as reported by Major Doolittle.

As a matter of interest, the load factor from the previous Dept. of Commerce rules (and presumably under which the airplane was originally calculated) works out to be 4.5, for a power loading of 12.3 lbs. per sq. ft. and a gross weight of 17,500 lbs.

Using a 50 ft. per sec. gust, the load factor developed becomes

$$\triangle n = 2.305 \times \frac{50}{30} = 3.84$$

$$n = 1.5\ (1 + 3.84 \times 1.09) = 7.77$$

which is much higher than usually used.

It is reasonable to assume that under the old rules of the Dept. of Commerce, the minimum margin of safety might be 1/3, so the strength of the structure might be somewhere near 6g. In the newer airplanes, however, the margins will not be nearly so high so that, based on the 5.25g value, about the same strength will be obtained. At the same time, the loads imposed on the airplane have become greater due to the higher speeds.

The 180 m.p.h. speed used in this discussion is conservative since it represents the cruising speed of many airplanes today. If the 30- and the 50-ft. per sec. gust be compared at higher speeds, say 210 m.p.h., the difference would be still greater. It is difficult to see the justification for the contention that the lowest gust velocities be connected with the higher airplane speeds, for it seems reasonable to assume that the pilot will be hurrying along as rapidly as possible in the type of weather which is associated with the severest bumps.

The effect of increases in airplane speed on the accelerations developed is shown in the accompanying diagram, on which have been plotted the airplane accelerations developed for the various gust velocities against airplane speed. The diagram has been plotted from values based on a wing loading of 15 lbs. per sq. ft. and arrived at in a manner somewhat similar to that used in determining the 50-ft. per sec. gust velocity. It will be observed that, while combining any one gust velocity with higher airplane speeds gives a lower value of $\triangle\alpha$ (or change in angle of attack due to the gust), this effect is offset by the fact that, for any given angle, the accelerations developed increase with the square of the speed.

The results of these computations seem to indicate that fast transport airplanes must be penalized by insisting that they carry high load factors on the chance that these severe gusts may be encountered. This seems a step in the wrong direction.

Several lines of thought suggest themselves as leading to a possible solution of this problem. First, the pilot may become more weather-wise and the number of weather observations increased so that such dangerous air conditions may be avoided. Secondly, the speed of the craft may be reduced when dangerous weather conditions are likely to be encountered, although for psychological reasons this may be unlikely. Lastly, and what appears most logical in some ways, is to so design the airplane that only small lift coefficients can be developed—or rather that airfoils with a low lift curve slope be used. If this is done, even for large changes in angle of attack, high values of C_L, and therefore high wing loads, will be avoided. The value of C_{Lmax} should probably not exceed one. The resultant high landing speeds could be reduced by providing the airplane with auxiliary lift-increasing devices such as manually-controlled flaps and slots. Such devices are usually accompanied by the disadvantages of complicated controls, certain troubles with stability, and generally necessitate excessively large angles of attack on landing.

While the case cited here may, as more acceleration records are taken, prove to be an exception in normal transport flying, the possibilities of such high gust velocities and the accompanying high acceleration should be given more consideration in the design of fast transport aircraft.

Vortices and Low Aspect Ratio Airfoils

RAOUL J. HOFFMAN

While Mr. Hoffman's presentation of his new theory in relation to the effects of low aspect ratio is highly unorthodox and conjectural, it is presented because of its originality and likelihood of evoking valuable discussion.

The advent of the low aspect ratio flying-wing brings a new consideration of the airflow and vortices.

Two main groups of vortices of high aspect ratio airfoils may be considered passing through the air, one starting at the trailing edge and the other starting at the wing tips.

The trailing edge vortices are a double row of cyclic motions, closely staggered with reversed rotation and with axes normal to the airflow. They are, therefore, pulsating and unstable.

The wing tip vortices have a cyclic motion along a cylinder or a helical (or concoidal) motion along a cone, usually diverging in the direction of the flow with their axes parallel to the flow. There may be two or more such concoidal air streams leaving the airfoil.

It is assumed that the maximum lift decreases as the aspect ratio is lowered. According to N.A.C.A. report 431 this is true up to a certain aspect ratio, but by lowering the aspect ratio still further, the maximum lift increases nearly 80% over the one attained with an aspect ratio of 6.

This characteristic may be explained by the interference of the two specific vortices. At a certain aspect ratio the interference of the two vortices may be such that it creates a maximum turbulency, which seems to occur at an aspect ratio of about 3. Lowering the aspect to about 2-1.5, the helical vortices may prevail and leave the airfoil (which is but a twin wing tip), in a continuous stream of double cones. At this aspect ratio the maximum lift may be increased due to the stability of the flow.

The next step would be to change the diverging concoidal flow to a converging flow (whirl) in order to terminate the turbulency a short distance behind the airfoil and envelop the turbulency region by a new streamline flow.

This may be accomplished by the drooping of the lateral median line of the airfoil, and by having a W leading edge in case a center body is present. This body should be designed integral to the median line of the airfoil, close to the body.

Basic Design Features of the Pan American Sikorsky Model S-42 Airplane

(*Continued from the August issue*)

H. A. FRANCHIMONT

Aircraft Engineer, Pan American Airways, Inc.

While this is written, the P. A. A. Brazilian Clipper Sikorsky model S-42, is on its maiden trip over the P. A. A. airline in South America. The following is a continuation of its description and an introduction to some of the basic aerodynamic necessities for efficient wing design in general.

● Shape and size are closely related to the efficiency of a wing for air transportation. It has been recognized for more than 25 years that air losses at the wing tips are of considerable magnitude, and the theoretically ideal wing would be one of infinite span with no tips. Although this is not possible of achievement, tip sizes can be substantially decreased in respect to the chord length and span. A practical solution is to employ a wing with a high aspect ratio, tapering in plan view, and with favorably rounded off tips. This simple device has not always been used because the important structural parts of the wings (mainly the wing spars) are becoming longer and shallower and, therefore, relatively heavier, more difficult to manufacture and for these reasons, more expensive. On the other hand, the demand for commercial airplanes was practically without specifications, and first cost became a major consideration. Manufacturers have been led to overemphasis on low cost production, rather than the profitable employment of the planes in the customer's service and in airline exploitations.

It has been said that a wing is an inefficient carrier because by its very nature and on account of the downwash, it must continually travel "uphill." This evil is reduced if we use the equation for the required power to give the wing the necessary lift. This equation is: $h.p._i =$ span loading squared divided by three times the speed; or, $h.p._i = \frac{\text{span loading}^2}{3V}$.

A gross weight of 38,000 lbs., and a span of 114 ft., give a span loading of 38,000/114 = 330 lbs. per foot of span, and, for flight at 160 miles per hour, $h.p._i = \frac{330^2}{3 \times 160} = 227$ horsepower. In the case of the Sikorsky S-42 equipped with $4 \times 675 = 2700$ h.p. (even 2800 h.p.) only 227/2800 = 8.1% of the total available engine power is required for wing lift. The above equation also shows that the faster the ship flies the less is the horsepower required for lift. For example; twice the speed requires only half of the horsepower for lift. The equation shows thus the rapidly decreasing of required lift h.p. (induced h.p.), as the span loading is decreased. For the same wing loading in lbs./sq. ft. of wing area, and for the same wing area, the lift h.p. required is only 25% for a wing with an aspect ratio of 10 as compared to a ratio of 5.

Induced drag h.p. required of a wing is not all that is necessary to move it through the air. The induced drag is actually useful drag because in exchange for the power it absorbs it gives the lift necessary to carry the plane. The other portion of the wing drag, the so-called "profile drag," is actually parasite drag —it gives nothing useful and necessitates the expenditure of a considerable amount of horsepower. Profile drag is proportional to wing area A and profile drag

Passengers boarding the Sikorsky S-42 just before her departure from Miami for South America on the first leg of her maiden voyage to Rio de Janeiro for the Pan American Airways System

coefficient C_{do}, and it is desirable to keep these two values to a minimum. A low value of A means a small wing area, and hence a high wing loading, because (generally) wing loading = weight of plane/wing area. Consequently, the wing loading for the S-42 has been raised to 28.5 lbs./ft.² as against about 19.5 lbs./ft.² in the S-40. On that account alone the S-42 should require only about $\frac{19.5}{28.5}$ = 68.5% of the profile drag existing in the S-40.

It follows, then, that increasing the wing loading decreases the wing profile drag and brings the wing into a required angle of attack which is nearer to the maximum L/D value of the wing.

This value is useful in still another way—it decreases the total weight of the wing, and the structural weight saved permits increasing the useful load; the payload or carrying capacity of the plane, and its usefulness, therefore are improved, especially for long range flights. This effort to use all practical means to decrease the horsepower required to overcome the drag of the wing (and, in fact, of all parts of the airplane) is of fundamental importance, because economy of horsepower required means a lighter power plant. More particularly, however, it is related to fuel economy, because the weight of fuel and oil necessary for a long range flight is as yet many times greater than the payload. Within a short time we expect to have planes in flight carrying more than ten tons of fuel and oil, and no efforts should be spared to economize on their consumption when such weight-savings revert immediately to additional revenue load. This saving can be achieved in three ways which should act simultaneously: (1) decrease of drag of the airplane as a whole, (2) increase of thermal efficiency of the entire power plant and (3) improvement in the aerodynamic efficiency of the propellers.

Another point will still further explain the importance of high aspect ratio of the wing in obtaining aerodynamic efficiency. Referring to the general downwash velocity as V and the mass of the air thrown down M, then the lift is expressed by ΣMV (the same general law holds for propellers. in so far as the propeller thrust is concerned in relation to the slipstream). This MV is obtained by the engine power, and originally by the fuel which weighs considerably. The amount of energy stored up in the air (kinetic energy), is expressed by $\Sigma \frac{1}{2}MV^2$ which energy imparted to the air when the airplane passes, is pure loss after the airplane has passed. Whereas the general product of MV is constant for a certain lift, if we disregard cost in power it does not matter whether we increase M and decrease V or vice versa providing the product MV remains constant, but if we pay due respect to power cost (expressed by $\Sigma \frac{1}{2}MV^2$) conditions will be viewed differently. For instance, for half the mass, the required downwash velocity becomes twice as great, and the lost kinetic energy becomes $\frac{1}{2}$ $(\frac{1}{2}M) \times (2V)^2 = \frac{1}{2} \times 2MV^2$ or twice as much as $\frac{1}{2}$ MV^2.

This simple mathematical manipulation shows clearly the importance of acting on a large mass (therefore large quantity) of air and this can be done most efficiently by using a large wing span so as to engage and utilize an enormous quantity of air mass. For a given wing area, this will reduce the required wing chord and increase the aspect ratio. Reducing the wing chord means also at a given speed reducing the time of acting upon the air, which is important, because the longer we act on the same column of air pulling it down, the less will grow its resistance, alias "lift."

The following general rule (to which high aspect ratio conforms) is for an efficient wing: Utilize a large mass of air and do so quickly. To a large extent high aspect ratio also increases the value of C_{Lmax} (maximum lift coefficient) of a wing, which allows higher wing loadings for a given stalling speed, (and landing speed) decreasing excessive wing area and saving power.

And now about the usual fear of increasing the weight of a wing itself (expressed in lbs./ft.² of wing area) on account of the higher aspect ratio. We cannot get something for nothing and we should not expect to do so; everything must be paid for and our concern is whether or not the price is fair. Suppose we have a wing with an aspect ratio of 7 and a wing loading of only 19.25 lbs./ft.² (planes like this, and even with less wing loading, are still flying today) and the wing weighs, say, 1.75 lbs./ft.² Then the net lift = 19.25 — 1.75 = 17.50 lbs./ft.² of wing area. If we compare this with a more modern wing design having an aspect ratio of 10 and a wing loading of 29 lbs./ft.² and a wing weighing, say, 3 lbs./ft.², then the net lift = 29 — 3 = 26 lbs./ft.² as compared to only 17.50 lbs./ft.² in the former case. Both wings are provided with high lift devices, the latter even of a less effective type. The increase in net lift per unit of wing area = 26 — 17.50 = 8.50 lbs./ft.² which must be added to 17.50 lbs./ft.². This represents a gain of $\frac{8.50}{17.50}$ = 48½%. This is worth while when it is considered that both the wings under comparison allow the same stalling speed. This quality of increasing the net lift offsets several times the increase in the weight of the wing per ft.² of area.

Another factor influencing the quality of a wing is the airfoil section. The S-42 is provided with a very good airfoil of the GSM series (the first letter standing for the designer of the airfoil, Mr. Gluhareff, the second letter for Sikorsky, the M being Mr. Gluhareff's first initial). An airfoil is not necessarily an efficient one merely because it looks good. Air passing along a wing curve is subject to the laws of nature and its characteristics can be calculated. Every designer has his pet ideas concerning these laws, and as long as these ideas are logical and in harmony with nature, good results are obtainable. In 1919 the writer originated, calculated and designed the Curtiss C-27 airfoil (intended to be exactly 7% thick) for high speed airplanes. For racing airplanes this proved to be a desirable curve as it has very low drag at the lower values of the lift coefficient, and consequently at high speeds. Data on it appear in several books on aerodynamics. If, however, the wing curve is a haphazard continuation of various curves (which, as a whole, may be pleasing to the eye but actually jolt the airflow from one law of motion into another, in rapid succession) then the results, except by mere chance, may be predicted to be mediocre.

Let us now consider the influence of the wing trailing edge flap as used between the ailerons. It is strange that flaps of the aileron type have not been in general use long ago, but the reason might lie in the explanation at the beginning of this article—the dominating factor of low first cost of the airplane. The action of ailerons for lateral stability is not to be found in the loads on the ailerons themselves, but upon the influence they assert on the portion of the wing ahead of them. When one aileron is lowered, it creates an obstacle to the airflow under the wing, slows down the airflow and increases the air pressure under the wing. This in turn causes an increase of speed on top of the wing and (according to Bernoulli's theory) decreases the pressure above the wing. The other aileron raised has the opposite effect at the other wing end, namely, a decrease of pressure below and an increase of pressure above, or a decrease of suction at the top.

These different lifts at the wing ends create the restoring rolling movements. The same phenomenon of lift variations can be created over the center portion of the wing; for instance, that portion between the ailerons can be used according to requirements of speed variation, to increase the lift coefficient at slower speeds (take-offs, climbs, landings) and decrease lift coefficient at faster speed. These devices are generally known as "high lift devices," but "speed range devices," a term used by the writer for fifteen years or so, would seem more descriptive nomenclature. The purpose is to "increase the speed range," i.e. to increase

the ratio of "flying speed to stalling speed," whatever the flying speed may be. For commercial aviation the flying speed is, broadly, the "economical" speed, which is not only dictated by the airplane, power plant (including propellers) and fuel consumption, but also by conditions over the airlines, such as distance, schedules, weather conditions, and occasionally by time of sunrise and sunset, etc. The demand for speed range is such that it should be as extensive as practically obtainable. The main object of a speed range device is (or has been) to increase the lift coefficient so we can fly and land slowly. Another and almost equally important object of a speed range device is to decrease the lift coefficient when fast flight is desired, without decreasing the angle of attack to such an extent that the ratio of L/D becomes too uneconomical. For flying faster, the answer is to "ease off the airflow" and turn up the trailing edge flap, decreasing the lift of the wing as explained in the case of turning up ailerons. This method creates a wing section with reversed curve at the trailing edge, but is more economical than the decrease of angle of attack of a fixed wing. Decreasing the angle of attack in a fixed wing to very low angles creates an antagonistic condition between the front and rear portion of the wing. The lift on the front part is considerably decreased and the lift on the rear portion is increased, but to a lesser extent. The consequences are that the obtainable smooth flow and the economical front portion of the wing do not work to their full capacity. On the other hand, the rear portion, which should ease off the flow, does too large a proportion of the work in producing lift and whips the air off behind at high speed, creating big losses by $\frac{1}{2}MV^2$ which are revealed by high drag. Furthermore, as the lift shifts farther backwards as mentioned above, the center of pressure travels backwards, a phenomenon which should be reduced to a minimum for aerodynamic stability as well as for structural reasons. Easing off the airflow by turning up the trailing edge flap is by far a better method of obtaining high speed than merely decreasing the angle of attack. This is because the front part of the wing remains efficient, and the rear end decreases its own lift more or less in proportion as does the front part, thereby keeping the center of pressure travel within small ranges. The L/D also is better, as the kinetic energy ($\frac{1}{2}MV^2$) of the air at the trailing edge is less than in the former case. The same phenomenon is made use of in water pumping stations, wind tunnels, etc., where exhaust tube ends are conical, widening towards the outlet so as to keep V at the outlet small, decreasing the spillage of kinetic energy. The phenomenon is also made use of in the application of fillets between neighboring bodies such as fuselage and wings, etc., which, as is well known, start with a small radius of curvature forward and terminate at the rear with a much larger radius of curvature. This has the effect of easing off the airflow, driving its path along the fillet boundary, slowing it down, decreasing V and decreasing $\frac{1}{2}MV^2$. All energy left in the air and created by the passing of the airplane through it has actually been delivered by the power plant and hence the fuel, representing weight which cuts in severely on the payload. Every practical device should be utilized to decrease drag no matter under what form this drag may be created or disguised.

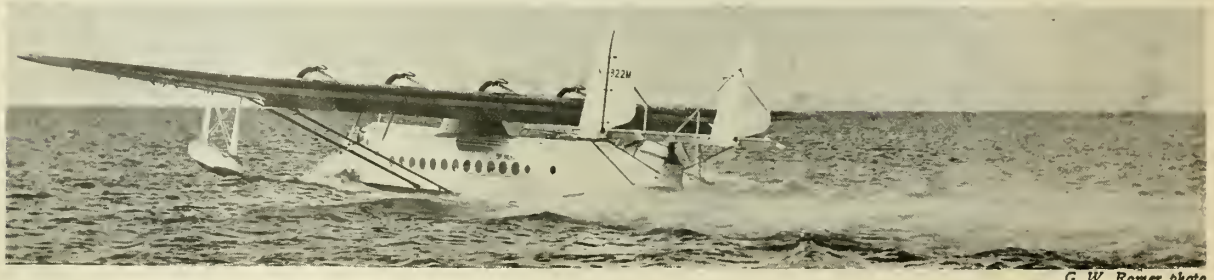
All ailerons and aileron-type flaps are actually derived from one original idea—that of altering the wing profile during flight so as to obtain a speed range as wide as possible.

Many such devices have been originated, one of the first (if not *the* first) being patented by Paul Zens some 24 years ago. In Zens' device almost the entire wing curve could be changed, increasing and decreasing the camber at will. Actually, the warping of the whole wing could be realized, as the Wright brothers' patents only covered warping the "lateral portion" of the wing for lateral stability control. Among interesting devices which have been studied is one consisting of a laterally rotatable wing nose which could be turned so as to present a sharp contour effective for ultra high speed, and a nicely-rounded high lift contour for landing. Efficient speed range devices can be achieved by combining ideas, such as the most energetic of trailing edge flaps for landing, in conjunction with reversing the wing curve for cruising or high speed. Ailerons could also be incorporated in the speed range device, making them effective over the entire wing span, yet providing for lateral control near the stalling speed which is possible. The devices mentioned, as well as slots, are but a few of many possibilities available to assist in increasing the wing loading and making the airplane a more practical vehicle.

High wing loadings are also necessary to insure comfort for the passengers and crew—not only a desirable feature, but also a required quality for any transport airplane. Discomfort, uneasiness and air sickness do not occur in a plane with heavy wing loadings, and in this respect the S-42 is again a step in the right direction. For a given cruising speed the value of the required lift coefficient is practically proportional to the wing loading, and a wing loading twice as high requires a similarly proportional high value for the lift coefficient. When atmospheric disturbances occur at that speed, the angle of attack on both wings alters about the same number of degrees. Whereas the C_L (lift coefficient) curve within the flying range is practically a straight line, it is seen that the pro ratio change of the lift coefficient (and hence the lift) is more severe on the lowly-loaded wing and plane flying at a low angle of attack, than on the heavily-loaded plane flying at a higher angle of attack. A lightly-loaded plane is tossed about in the air. Wing loadings of 28.5 lbs./ft.^{2} are moderate compared to what is possible of attainment, and a wing loading of 40 lbs./ft.^{2} with a sea level landing speed of 65 miles per hour is not a difficult aerodynamic problem and is certainly advantageous from the structural standpoint.

A plane with heavily-loaded wings being less affected by lift variation is subjected to a narrower range of stresses in the entire structure (which is advantageous) than a plane with low wing loading. For the same load factor, the plane with heavy wing loading will have a greater longetivity and require less maintenance cost. Initial cost of the plane will also be less due to the reduced wing area and its attendant lesser structure.

(*To be concluded in the October issue*)



G. W. Romer photo

The Sikorsky S-42 Brazilian Clipper about to take off from Biscayne Bay, Miami, for the start of its inaugural flight to South America

WACO CABIN SEAPLANES

● Rounding out its line of 1934 aircraft, the Waco Aircraft Co., of Troy, Ohio, has introduced three new cabin jobs mounted on floats.

These planes, the models UKC with Continental engine, the YKC with Jacobs engine and the CJC with a Wright J-6, were flight-tested by John Livingston of the Waco Company, George B. Post of the Edo Aircraft Corp., and Joseph Boudwin of the Department of Commerce. Approved type certificates have been granted to each as a seaplane, featuring a new-type float just designed and placed in production by the Edo company at its College Point, Long Island, factory. The floats are known as model 38-3430 and, conforming with the usual Edo practice, each has a total displacement which corresponds to its model number, namely 3,430 pounds. Under Department of Commerce requirements (which call for 90% minimum buoyancy) a seaplane on these floats can be licensed for a gross weight of 3,610 lbs.

The new floats replace the model P-3300 floats which have been the standard model in this class since they were first introduced in 1929 and have been licensed and widely used on such ships as the cabin Wacos, the Stinson Juniors and some of the earlier ships in the 3,000 lb. class. The new floats, however, in addition to being larger in submerged displacement by 130 lbs., each, incorporate a number of improvements.

Their V on the bottom has been increased from 20° to approximately 26° in order to reduce the shock of high speed landings and to improve their rough water characteristics. At the same time, the triple flutes on either side of the keel in the forward planing bottom of the old P-3300 floats have, in the new design, been reduced to double flutes, more sharply defined and made more effective by flush riveted planing strips at the sister keelsons and chine, introduced for more accurate control of spray in the high speed planing condition.

Other improvements include the introduction of duralumin spreader bars of streamline section which protrude from the side of the float, and a water rudder installation permanently built into the stern of the float and provided with over-size bearing area and Zerk fittings to overcome the results of chattering imposed by steady service. Another development is an extra long skeg casting at the step, designed to prevent the floats from tipping backward when nosed up on a steeply inclined runway. A steel rubbing strip is inserted in this skeg at the point of greatest wear aft of the step and so installed that it may be removed and replaced without penetrating the skin of the float. In this way, the possibility of introducing leaks as a result of replacing the fitting is eliminated.

Although larger in displacement than the model P-3300 floats, the new jobs achieve a saving in weight of approximately 25 lbs. per pair. They have a normal track between center line of 100 in., an overall length of 19 ft. 4 in. (not including water rudders), a beam of 31⅛ in., and an overall height of 29 13/32 in. Front and rear spreaders are spaced 54½ in. apart and braced with streamline wires between them. The floats have relatively small bumpers at the nose and rather fine lines of entry. Their lines are constantly curving in both side and elevation views and have evidenced excellent drag characteristics.

	Airplane Model	Make of Engine	Length Over all	Height Over all	Span	Wing Area—Sq. Ft.	Gas Capacity—Gals.	Oil Capacity—Gals.	Gross Weight—Lbs.	Empty Weight—Lbs.	Useful Load—Lbs.	Pay Load—Lbs.	Wing Loading—Lbs. Sq. Ft.	Power Loading—Lbs. H.P.	Top Speed m.p.h. at 2100 r.p.m.	Cruising Speed m.p.h. at 1900 r.p.m.	Landing Speed m.p.h.	Climb First Min. Ft.	Service Ceiling Ft.	Gas Consumption at Cruising Speed Gals.—Hr.	Estimated
CABIN "C"	UKC 2850 *	Cont. 210	25′ 2½″	8′ 6″	33′ 2⅝″	240	60	4	2850	1745	1105	605	11.9	13.5	145	128.5	60	800	14000	13	
	UKC 3000 *	Cont. 210	25′ 2½″	8′ 6″	33′ 2⅝″	240	50	4	3000	1755	1245	745	12.5	14.3	143.5	128	52	750	13000	13	
	UKC Seaplane	Cont. 210	28′ 9⅞″	10′ 7″	33′ 2⅝″	240	50	4	3250	2131	1119	619	13.5	15.5	126	105	56	600	11250	13	
	YKC 2850 *	Jacobs 225	25′ 4⅜″	8′ 6″	33′ 2⅝″	240	50	4	2850	1800	1050	550	11.9	12.7	149	129	50	850	15500	14	
	YKC 3000 *	Jacobs 225	25′ 4⅜″	8′ 6″	33′ 2⅝″	240	50	4	3000	1808	1192	692	12.5	13.3	148.5	130	52	800	15000	14	
	YKC Seaplane	Jacobs 225	28′ 9⅞″	10′ 7″	33′ 2⅝″	240	50	4	3250	2186	1064	664	13.5	14.4	130	109	56	700	12000	14	
	CJC	Wright 250	25′ 7⅛″	8′ 9½″	34′ 10″	264.3	70	5	3200	1976	1224	596	12.1	12.8	152	134	53	850	16000	16	
	CJC Seaplane	Wright 250	28′ 10″	10′ 8″	34′ 10″	264.3	70	5	3650	2296	1354	726	13.8	14.6	132	110	56	750	12000	16	
"F3"	UMF	Cont. 210	23′ 1″¾	8′ 5⅜″	30′	233.5	50	4	2500	1485	1015	515	10.7	11.9	143	128	47	1100	14500	13	
	UMF Seaplane	Cont. 210	26′ 7″¾	10′ 2″	30′	233.5	50	4	2750	1735	1015	515	11.8	13.1	128	112	50	800	14000	13	•
	YMF	Jacobs 225	23′ 3⅝″	8′ 5⅜″	30′	233.5	50	4	2500	1540	960	460	10.7	11.1	147	129	47	1250	16000	14	•
	YMF Seaplane	Jacobs 225	26′ 7¾″	10′ 2″	30′	233.5	50	4	2750	1790	960	460	11.8	12.2	132	116	50	850	15000	14	•
WACO "D"	CHD. Training	Wright 250	25′ 9″	8′ 11½″	32′ 8⅝″	256.3	87	8	3200	2230	970	182	12.5	12.8	160	140	53	1000	14000	16	•
	C2HD	Wright 285	25′ 9″	8′ 11½″	32′ 8⅝″	256.3	87	8	3200	2230	970	182	12.5	11.2	167	146	53	1200	14500	19	•
	JHD	Wright 330	25′ 2″	8′ 11½″	32′ 8⅝″	256.3	87	8	3400	2300	1100	348	13.3	10.3	176	154	56	1400	16000	22	•
	WHD Comm.	Wright 420	25′ 2″	8′ 11½″	32′ 8⅝″	256.3	87	8	3400	2300	1100	348	13.3	8.1	191	166	56	1750	21000	28	
	WHD Military	Wright 420	25′ 2″	8′ 11½″	32′ 8⅝″	256.3	107	8	3800	2300	1500	628	14.8	9.1	187	164	63	1550	20000	28	•
	WHD Seaplane	Wright 420	28′ 6″	11′ 2″	32′ 8⅝″	256.3	107	8	4100	2640	1460	588	16.0	9.8	168	147	65	1200	18000	28	•
	SHD	P. & W.300	25′ ⅛″	8′ 11½″	32′ 8⅝″	256.3	87	8	3400	2300	1100	348	13.3	11.3	170	148	56	1300	15500	20	•
	S2HD Com. **	P. & W.375	25′ ⅛″	8′ 11½″	32′ 8⅝″	256.3	87	8	3400	2300	1100	348	13.3	9.1	184	161	56	1600	23000	25	•
	S2HD Mil. **	P. & W.375	25′ ⅛″	8′ 11½″	32′ 8⅝″	256.3	107	8	3800	2300	1500	628	14.8	11.1	180	158	65	1100	22400	25	•
	S3HD Com.	P. & W.420	25′ ⅛″	8′ 11½″	32′ 8⅝″	256.3	87	8	3400	2300	1100	348	13.3	8.1	191	166	60	1750	21000	28	
	S3HD Mil.	P. & W.420	25′ ⅛″	8′ 11½″	32′ 8⅝″	256.3	107	8	3800	2300	1500	628	14.8	9.1	187	164	63	1550	20000	28	•

**All figures at 7500 feet

Specifications and performances of the complete line of Waco military and commercial airplanes

Brown Racing Airplane with 300 h.p. Engine

L. W. Brown and two views of the racing plane he designed and constructed for participation in the 1934 National Air Races

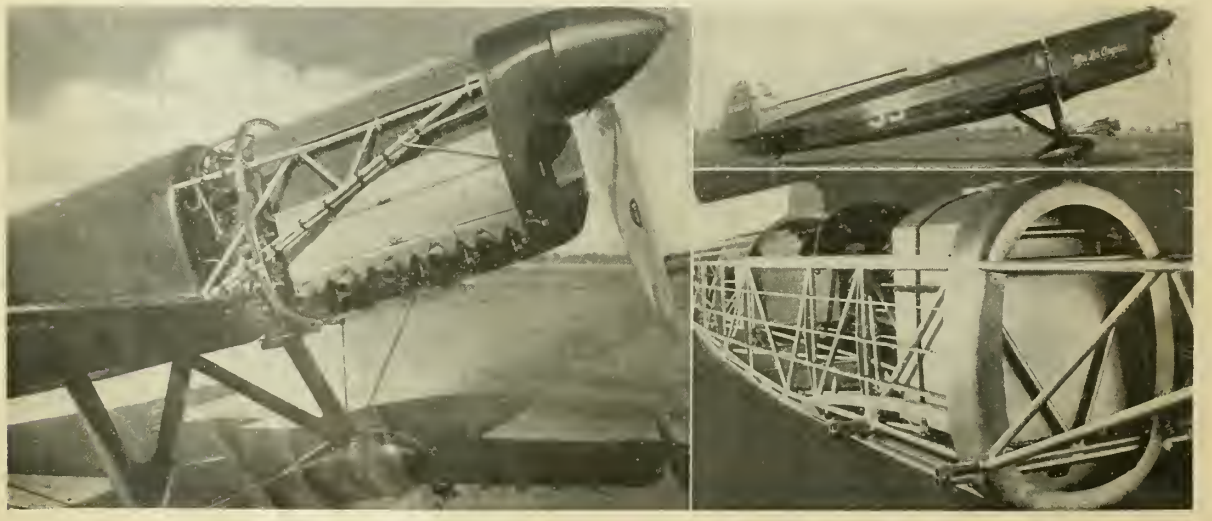
● The *Miss Los Angeles* is a Menasco-powered racing plane developed for Roy Minor by the Lawrence W. Brown Aircraft Co., of Los Angeles to challenge the supremacy of the superpowered racers that hitherto have dominated the picture with their engines in the 750-1,000 h.p. range. With a C-6-S Buccaneer engine of about 300 h.p., the *Miss Los Angeles* has a straight-away speed of about 270 m.p.h., but is so cleanly streamlined and so lightly loaded by comparison with heavier and more powerful planes, that it is anticipated that at the 1934 National Air Races, she will prove much faster on the pylons and thereby compare favorably with planes with higher top speeds.

This plane, the third of a series of speed planes constructed by the Brown company during the past year, is a smaller counterpart of a larger, more powerful and much faster plane now underway and with which it is hoped to set a new landplane speed mark. The company is also working on a project for the construction of a military pursuit ship powered with the same type Menasco engine as is mounted in Minor's ship. It is believed that there is a field for a small fighter which in the air will be somewhat similar to a torpedo boat destroyer on the water. Such a ship, with a wing span of 20 feet and weighing less than 1000 pounds empty, would mount two .32 caliber machine guns and have a top speed of about 220 m.p.h.

The Brown Special is an example of the thin wing wire braced monoplane with rigid landing gear and composite construction throughout. The fuselage is of welded steel tubing in rigid truss with the engine mount built integral. All surfaces are cloth covered, the wing being of wood construction, with two solid spruce spars, spruce and plywood ribs spaced at increasing intervals from root to tip and with steel tube and wire drag bracing. The wing is reinforced at the leading edge by two-ply cloth instead of wood or metal, a feature of Brown construction said to insure a smoother nose contour, greater resistance to tearing tendency on the part of the wing fabric, and is light in weight. Airfoil section is of a modified Curtiss racing curve with unusually sharp leading edge. Landing load cushioning is taken care of entirely by the Goodyear Airwheels, housed in torpedo-shaped pants.

Wing flaps, extending for about one-third of the semi-span, embody approximately 30 per cent of the wing chord and are of the simple trailing edge type operated by the pull of a lever in the cockpit working through torque tubes. With the flaps in the lowered position, landing speed has been cut to between 50 and 60 miles an hour. Ailerons are also torque tube operated, the aileron tubes passing through those which control the flaps.

The fuselage has been "tailored" to fit both the engine and the pilot, who is able to sit in a normal, comfortable position. The engine compartment is cowled with aluminum sheeting, as is the quarter deck to the rear of the cockpit. The cockpit itself is of the semi-enclosed type, the pilot's head being exposed for improved visibility, with a small windshield in front and a streamlined headrest back of the cockpit cut-out. A quick-release mechanism is provided to throw off the upper portion of the cockpit cowling should a parachute jump become necessary. Engine cooling is provided by a venturi type cowl which maintains proper operating temperatures while holding down the fuselage size to a maximum width of 27 in. and a maxi-



Detailed views of the Brown racing plane, showing engine mount, Menasco engine installation and fuselage construction

tremely useful thing to have in the bow during water handling.

The peculiar engine installation is the result of intensive research. For many reasons a pusher was desired. One of these is that a tractor on a seaplane is in the way to an extent that can only be realized by those who, in a difficult water-handling situation, have had to get rapidly to the bow of the boat. It enhances comfort greatly to have no propeller spinning in front of the cabin. Moreover, I have believed for a long time that the pusher will eventually prove more efficient than the tractor. But the standard pusher installation with a radial engine has two sources of inefficiency: it is difficult properly to streamline the engine, and the engine so cuts off the air to the propeller as appreciably to reduce the propeller efficiency.

In the Curtiss-Wright Amphibion this was met by putting the propeller on an extension shaft, an arrangement which provides a well-streamlined nacelle and a resulting clear air flow to the whole propeller. Moreover, a large fineness ratio for the nacelle was unnecessary for these results, so that a short shaft was sufficient. I have done a lot of untroubled flying with various kinds of planes with far more elaborate arrangements of internal engines driving external propellers through several gears and shafts, so I saw nothing to worry about in a 31-inch extension shaft with one flexible coupling.

The engine is supported both fore and aft. The main mounts of rubber vulcanized to steel, are attached to a ring which would be a conventional engine mount ring, only for the fact that the front spars of the upper wing bolt to its two sides, so that the mounting ring actually constitutes a continuation of the upper wing beams. This ring remains attached to the engine when the engine is removed, the wings then being held in place by other members of the structure. The rear of the engine (which is the nose), has a special ring attached, consisting of rubber vulcanized between two steel rings. This ring is supported by a clamp attached to the rear beam structure in the center section. Behind this is a flexible coupling from which the extension shaft is carried rearward. The rear of the extension shaft is supported in a self-aligning ball bearing. The housing for this bearing is supported on a tripod, two legs of which go forward inside the wing to the rear wing beam; the other goes down to the hull.

In its final form, the addition of weight represented by this extension shaft unit will amount to some 65 lbs., and the increase in efficiency which it provides represents some 45 h.p.

Unconventional Installation

The unconventional method of installing the engine between the spars was adopted because a cowling design was possible, the flow around which was likely to cause minimum interference with the flow around the wing; second, it gave the nacelle-form required with a minimum of cowling and shafting, and third, it led to considerable saving of weight in that little had to be added to the center section to convert it into an entire engine mount. In addition, this position fitted in well with balance arrangements and provided a neat nacelle-wing combination.

One objection to this position was that it resulted in a high thrust line. The high thrust line is an overrated difficulty. It is met by a far forward center of gravity and a relatively large negative angle on the tail, the effect of the slipstream on which counterbalances thrust differences. This is often objected to on grounds of tail drag, but the induced drag of the tail, under the circumstances, is likely to be negative. In any case, trim and stability on the ship are good under all thrust and speed conditions.

The biplane wing arrangement has advantages over the monoplane scheme in this plane. The latter would have led to interference of wing structure members with cabin space, restriction of passengers' view, waste of weight and considerable drag in supporting the wing floats downwards and the engine nacelle upwards.

The biplane arrangement, with a reasonable stagger, permitted placing the lower wing entirely behind the cabin, and low enough so that only its thickness impedes the passenger's view. The wing tip floats can be directly attached to it, at the same time allowing ample water clearance. Similarly, the center section supports both wing and motor mount structures.

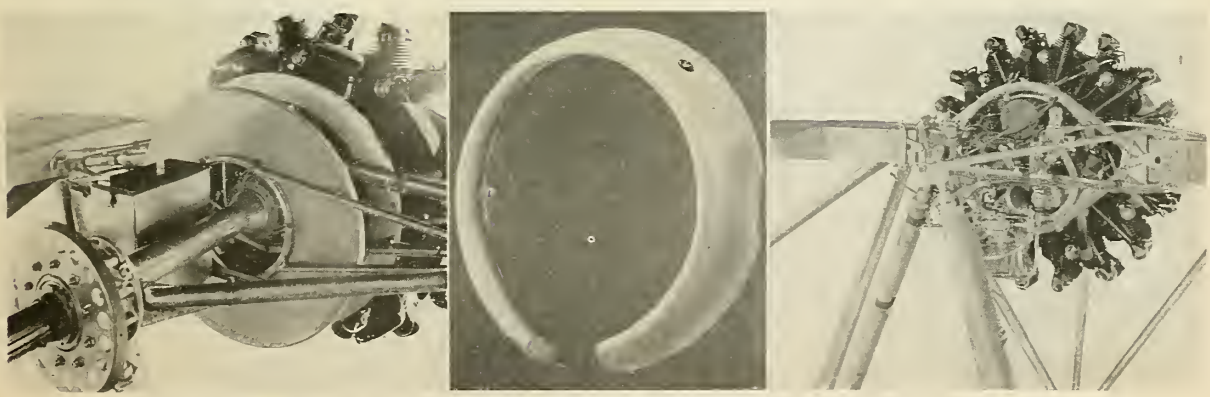
Considerable weight saving is also accomplished by constructing the gas tank as part of the hull structure, as well as forming the two rear seats. This tank system is less susceptible to damage and, if damaged, more easily repaired. Being built into the sturdiest part of the hull, the weight of the gasoline opposes the water loads on the bottom and, when pounding on rough water, the gasoline loads are spread over the entire bottom instead of being concentrated on local supports. An access plate makes it easy to effect repairs without removing the whole tank.

Ailerons are on the lower wing only, and with the large stagger, afford exceptionally good low-speed control and allow direct torque control from the hull, thus eliminating external struts and horns.

The design and construction of the hull was carried out by the Edo Aircraft Corp. under the direction of their chief engineer Mr. Korvin-Kroukovsky, who also aided in the detail design of the remainder of the structure. The hull is built of Alclad, anodized and painted, and the general structural design follows the well-known Edo pontoon lines.

The vertical fin is built integral with the hull and is also metal covered.

The combination of the above factors has led to a ship which, for an amphibion, is structurally light, aerodynamically clean, and offers excellent passenger accommodations.



Extension shaft and propeller rear bearing; combination oil tank and ring cowl; mounting ring between front wing beams

Aircraft Dynamotors

• NEW DYNAMOTORS for the operation of radio transmitters and receivers on airplanes, and other applications where light weight is important, have just been developed by the Electric Specialty Co., Stamford, Conn. The design has been worked out to provide high efficiency, low ripple voltage, reliability under all operating conditions, and for convenience in installation and operation.

Light weight is obtained by using aluminum and magnesium alloy castings, and by electrical and mechanical design utilizing the materials most effectively.

The use of laminated steel fields, special silicon steel armature laminations, precision ball bearings, and special brush box construction to reduce friction enhances efficiency, while low ripple voltage, allowing the use of simple filter equipment, is obtained by special design of the magnetic circuit and armature slots, by the brush box construction, and by the large number of commutator bars in both the low and high voltage commutators.

Reliable operation under severe conditions is insured by the enclosed construction, by the use of non-corrodible parts throughout, by vacuum impregnation of all windings, and by low temperature rise resulting from efficient design and liberal ratings. The machines are compact, with small overall dimensions and the brushes, brush boxes, commutators and bearings are readily accessible for maintenance.

These dynamotors are usually furnished to operate from 12-volt storage batteries and may be supplied to deliver a maximum of 1,500 volts and any capacity up to 500 watts.

Dynamotor for aircraft radios

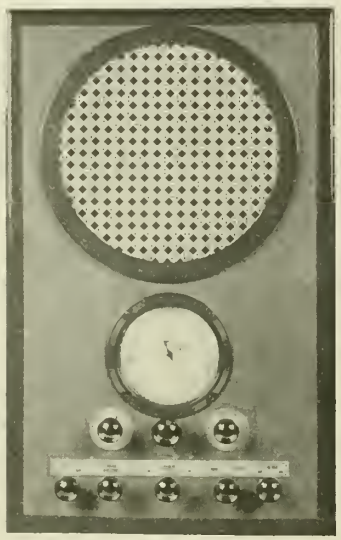
RCA General Purpose Radio Receiver

• MODEL AVR-5A, a general purpose receiver developed by the RCA Victor Co., Camden, N. J., supersedes the AVR-5 airport radio traffic control receiver.

It is a self-contained, AC operated, 9-tube superheterodyne unit, easily installed and operated and capable of receiving either continuous wave or modulated transmission within the frequency range of 150-18000 kc., in five bands.

The new model provides reception of airways weather reports as broadcast by the airways radio stations of the Department of Commerce; reception of transport line airport-aircraft communication; entertainment; and commercial or amateur code reception.

A rotary-type switching mechanism permits selection of frequency band which operates five different three-coil groups (15 in all), each of which is individually connected to the switch, and retaining the efficiency of each complete circuit.



RCA receiver model AVR-5A

An open-face, illuminated aircraft-type dial shows all frequencies and uses a double-ended needle pointer operating through 180° at a ratio of 55:1. Sensitivity with a minimum of background noise is attained through specially designed circuits and complete shielding, while sensitivity on the high frequency band is increased by an additional RF stage in the high frequency bands.

Construction of the AVR-5A is such that it will withstand all atmospheric conditions. It features a full-sized dynamic speaker (8-inch cone); control of RF sensitivity as well as audio gain, permitting lowering of the noise level as well as eliminating overloading of RF or IF circuits; selection of manual or automatic volume control; headphone or loudspeaker operation at the turn of a switch; and beat-note reception of CW signals on all frequencies. A switch on the panel controls the action of a CW oscillator when code reception is desired —an aid in locating extremely weak signals in the phone bands.

Airway Beacon Intensifier

• AN INCREASE of 400,000 candle power although wattage has been decreased by 500, has been obtained by the Department of Commerce in its 24-inch diameter airways rotating beacons on the Federal airways. The addition of a simple auxiliary reflector and the substitution of a plain cover glass for a prismatic covered glass on the beacons has given the increased luminosity.

Tests conducted by F. Chapin Breckenridge of the National Bureau of Standards of the Department showed that a 500-watt lamp with a plain cover glass and a new-type auxiliary reflector would give 2,000,000 candlepower, 25 per cent more than the 1,600,000 candlepower obtained with the 1,000-watt lamps formerly used and nearly 3 times more than is developed by the present beacons with 500-watt lamps.

The auxiliary reflector is mounted in front of the lamp and throws stray light that normally would escape from the front of the beacon back into the lamp and onto the main mirror at the rear of the beacon. This concentrates all of the stray light and increases the intensity. Similarly the plain cover glass causes less scattering of light from the beacon.

Fedders Heaters

• A VALUABLE piece of equipment for heating hangars, waiting rooms, etc., is the new Series 3 Unit Heater manufactured by the Fedders Manufacturing Co., Inc., Buffalo, N. Y.

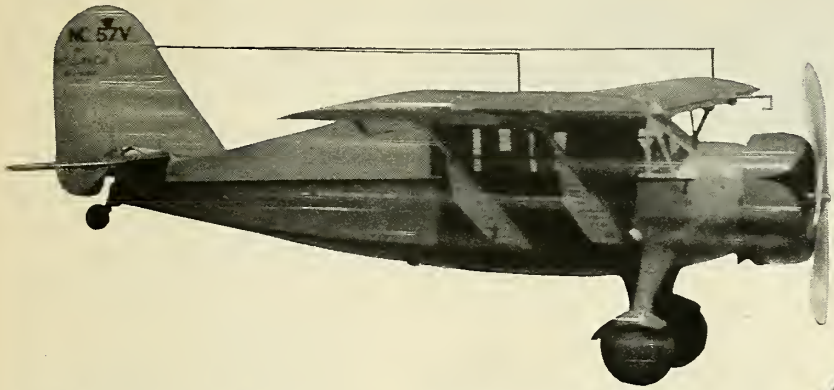
To meet demands in commercial installations, the cabinets are being designed in harmony with the simplicity of modern architectural practice. They are finished in a durable abrasion-resistant morocco-like texture and the cabinets are electrically welded into one piece with integral reinforcing members.

Special attention has been paid to the factor of quietness; streamline tubes, which provide large steam ways, patented fins and the entire construction combined with resilient motor mountings eliminate resonance and isolate vibration.

Header tanks have integral baffles to assure even steam distribution throughout the element. Specially designed full coating mountings maintain the alignment of the heating element within the cabinet, eliminate expansion stresses between element and cabinet and protect the element from piping strains. Efficiencies of heat transfer surface, air velocities and final outlet temperatures are balanced with each other.

(*Continued on following page*)

ALL SET FOR "HAPPY LANDINGS"



One of the new 1934 Bellanca "Senior Skyrockets." Top speed 185 mph. Equipped with Goodrich Low Pressure Tires for safe landings and take-offs.

NEW BELLANCA "SKYROCKETS" AND "PACEMAKERS" EQUIPPED WITH GOODRICH LOW PRESSURE TIRES

WITH nine successful Trans-Atlantic crossings, the first Trans-Pacific Japan-United States flight and the present World's Endurance Record to their credit, Bellanca planes are certainly in the forefront of aviation achievement. Now come the new 1934 Senior Series of "Skyrocket" and "Pacemaker" models to set new aviation records.

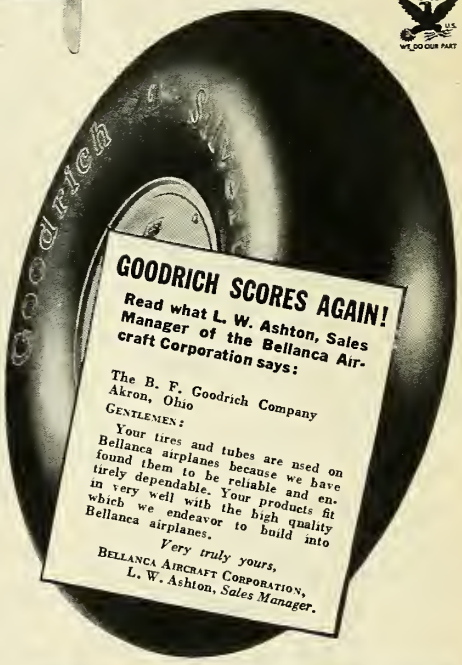
It's significant that Goodrich Low Pressure Tires are standard equipment on Bellanca planes. Bellanca officials recognize the importance of equipping their planes with a quality tire in keeping with the superior workmanship built into the planes themselves. They choose Goodrich Airplane Silvertowns. As with many other airplane manufacturers and commercial air lines, the consistent safety records of these big, rugged tires prove their dependability, year after year.

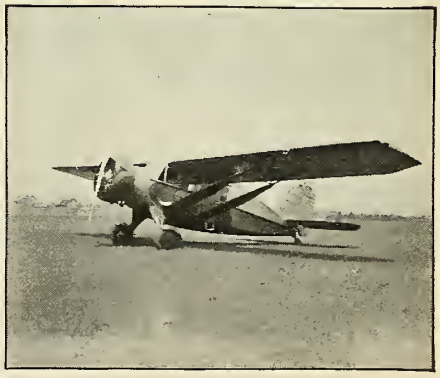
Investigate!

Give your planes the benefit of extra-safe take-offs and landings on Goodrich Airplane Silvertowns. See your nearest Goodrich dealer or write Dept. 444, Aeronautical Division of the B. F. Goodrich Co., Akron, Ohio, for complete information about Goodrich Airplane Products.

•

Whenever you fly, look at the tires. See how many times you take off on Goodrich Airplane Silvertowns





Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes—including Tires—Tail Wheels—Abrasion Shoes—De-Icers—Matting—Rubber Hose—Grommets—Shock Absorber Cord—A Complete line of Ruober Aeronautical Accessories.

Special motorcycle truck for transporting air express to and from airports

(*Continued from preceding page*)

Motorcycles For Air Express

• AS A result of an investigation by experts in the transportation department of the Railway Express Agency, a new-type vehicle has been developed to carry air express.

These special trucks are mounted on a Harley Davidson or Indian motorcycle chassis. They are three-wheel affairs, air cooled, and can carry a capacity load of 1,000 pounds in 69 cu. ft. of cargo space. The body is mounted over the rear axle and is so constructed as to afford thorough weather protection for the driver. Featured, in addition to rugged construction, are high speed, short turning radius and low fuel consumption.

Tests have revealed that these three-wheeled air express trucks are ideal for crowded city traffic. They can be parked in a small space and can easily be maneuvered through lanes of traffic. In the first 14 days of operation between New York and Newark Airport these trucks cut the time of average delivery to a group of Wall Street bankers to 55 minutes from the time the plane landed. This includes not only the deliveries to the consignees but also a non-traffic stop en route.

Precision Shafting

• TO OBTAIN highest machine efficiency and longest machine life, steel shafts must be in true alignment with bearings and with gears, pulleys, cams, clutches or other connected parts. Accuracy in size, concentricity, straightness and smooth finish of shafting are factors which develop noiseless machine operation, resistance against wear and minimize vibration. Particularly is this so where high speeds require the most perfect balance of all moving parts.

Union Precision Shafting, made by the Union Drawn Steel Co., Massillon, Ohio, is precise within very close limits in concentricity, straightness and size of diameter. Its surface is developed to mirror smoothness and the finished bar is one that warrants balanced operation in the most intricate mechanism.

This shafting is produced by turning, centerless grinding and burnishing to a high finish. These processes retain the physical properties of the hot rolled bar and so avoid any tendency toward warpage or distortion where shafts are machined for keyways, threaded for lead screws, etc. The shafting is available in a size range from ¾ in. to 8 in., inclusive and commercial size tolerances for carbon steels of .50 carbon and under are as follows: ¾ to 2 7/16 in., inclusive, exact to .002 in. under; 2½ to 8 in., inclusive, exact to .003 in., under and closer tolerances to .0005 in., on special order.

Physical properties of the shafting in low carbon steels are approximately as follows: tensile strength, 55,000 lbs./sq. in.; yield point, 30,000 lbs./sq. in., and elongation in 2 inches, 25-30 per cent.

Lighting and Mounting Instruments

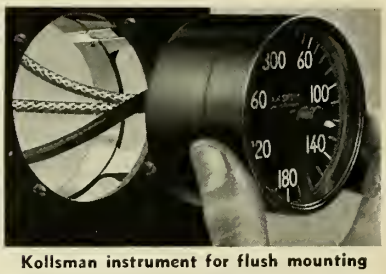
• MANY EXPERIMENTS were made by the Kollsman Instrument Company, Inc., Brooklyn, N. Y., over a period of several months, to develop a method which satisfactorily illuminates instruments on an aircraft panel and in which there was no glare or reflection of light from the instrument; uniform illumination of the dial and the pointer; no stray light; no complication in servicing the instrument; and individual direct lighting at reasonable cost.

The method finally adopted is an electric bulb which screws into a socket located in the center of the glass. The bulb seats on a leather gasket which insures an air-tight seal. The socket is connected by two wires placed in a groove in the glass to two copper discs on the outer edge of the glass, which in turn are in contact with two spring contactors in the instrument case. Both bulb and cover glass are replaceable from the front. Wires are molded in the case to two studs on the back and a snap connector permits quick wiring to the main battery line. All wiring and connectors are radio shielded with an adapter to take "Breeze" conduit casing.

The bulb operates on 1½ to 2 volts and draws 1/10 amp. All the bulbs on one board are rheostat controlled and the light may be adjusted to the desired intensity. The source of energy can be from the plane's storage battery, in which case a resistor must be placed in the line or standard #6 dry cells may be used, in which event wire shielding is unnecessary.

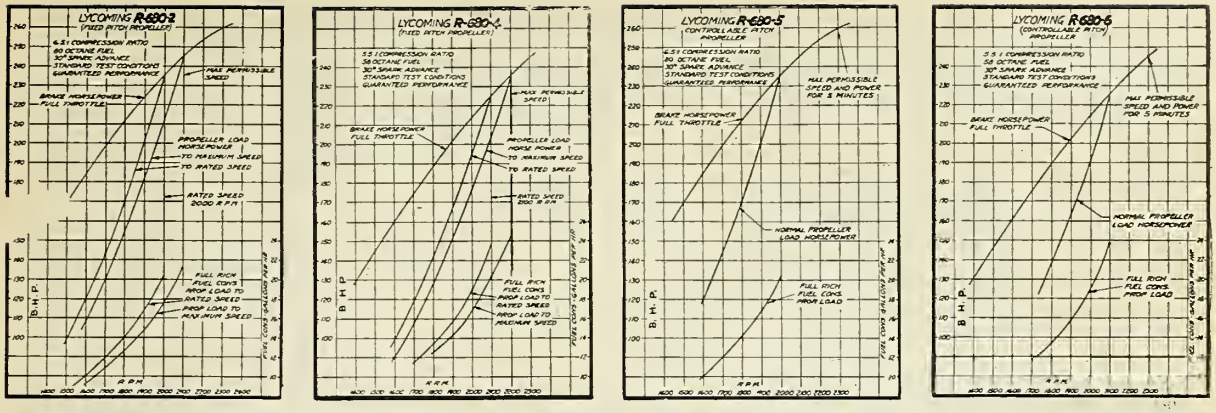
With individual lights for each instrument, the instrument board can be so wired that the navigation instruments will be in a circuit separate from the other instruments, allowing the former to be switched on independently thus relieving the pilot of the necessity of watching instruments that are not essential to navigation.

To eliminate the problems and difficulties of removing and reinstalling instruments mounted by the old method, the Kollsman company has designed an instrument for quick mounting. Instead of screwing the instrument by a mounting flange to the back of the instrument board, it is inserted from the front and held in place by a clamp. The instrument and its clamp have the same contour and mounting holes as the old type flange mounting instrument, and therefore are interchangeable with the latter.

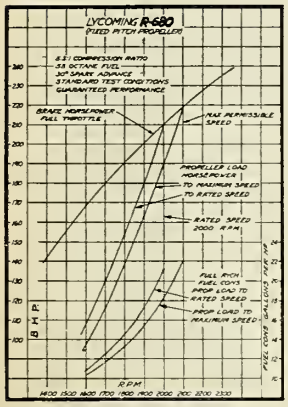


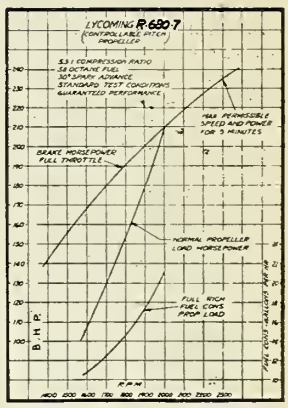
Kollsman instrument for flush mounting

The clamp is fastened on the back of the board with standard mounting screws and is operated from the front of the board by tightening or loosening the mounting screw at the upper right side of the clamp. With this universal device, any instrument is inserted in the board from the front, and by merely tightening the screw it is clamped in place flush with the board. The time necessary to install or remove any instrument is a matter of seconds. The clamp offers another advantage in that the instrument may be rotated to any desired position. Certain transport operators make a practice of having the hands of all instruments horizontal when the ship is cruising, allowing easy and quick reading since a deviation of the hand from its cruising position is immediately apparent, without the pilot having constantly to read each individual instrument. All connections to the instruments can be flexible, which facilitates removal.



Curves showing average performances of Lycoming engines





Past Air Corps training engine specifications are met by the design of the Model R-680-3 engine, while Model R-680-4 is identical with the R-680 except that cylinder heads are the same as the R-680-2 engine. The compression ratio is 5.5 to 1. and the rated r.p.m. has been increased to 2100. The carburetor air intake is the same as furnished on the R-680-2 engine.

Three engines in the series are similar to other models except for an increase in r.p.m. to take the installation of a controllable-pitch propeller. When variable-pitch propellers are used, they revert to their counterparts and are restricted in r.p.m. output. These engines are the Model R-680-5; Model R-680-6; and Model R-680-7. The first has its r.p.m. increased to 2300, reverting to R-680-2 with r.p.m. of 2000 when a non-controllable pitch propeller is used; the second is rated 2300 and reverts to engine Model R-680-4 with an r.p.m. of 2100 while the last is rated 2300 r.p.m. and reverts to Model R-680 with an r.p.m. of 2000. These engines have been redesigned to comply with the Department of Commerce's regulations which require changing of the name plate when installing a controllable-pitch propeller on an engine which was licensed with a non-controllable propeller and vice versa.

Ignition is furnished by one Scintilla dual type vertical magneto with two stationary sets of primary and secondary coils and two independent distributors. The rotating element is purely mechanical in character, consisting of a four-pole magnet rotating on ball bearings and carrying the breaker cam at its upper end. Distributors are driven by a separate shaft at right angles to the crankshaft, providing two entirely separate electrical currents, each firing one plug per cylinder.

The Stromberg NA-R7A carburetor is used. This unit is a single barrel type equipped with a mechanical economizer, mixture control and accelerating pump.

A standard starter drive operates directly on an extension of the crankshaft, to which may be attached an electric, inertia or a direct hand starter.

The tachometer drive unit is easily accessible when the engine is installed in the plane and the design is such that it can be withdrawn, together with its gear, for inspection.

A starter mounting with two additional drive pads for gun synchronizer, fuel or vacuum pump drives, can be supplied.

Cylinder design follows conventional lines for air-cooled engines. The cast aluminum alloy cylinder head with rocker arm supports cast integral, is screwed and shrunk on a machined carbon steel barrel.

Lycoming Model R-680-3 or 7

Exhaust valves of chrome tungsten steel have hollow stems, a modified tulip shaped head and are cooled with metallic sodium. Intake valves of tungsten steel have a solid stem with slightly concave heads. Valves are spread 30° from the cylinder center line and face the air stream to procure adequate cooling of the valve seats, which are of aluminum bronze shrunk into the aluminum head.

Cams, cam drive gears, cam followers, etc., are located in the forward part of the crankcase. The cams have four lobes each and run at ⅛ engine speed. Push-rods, rocker bearings and rockers are totally enclosed but the valve springs are exposed in order to prevent oil from collecting on the valve stems, to aid valve cooling and to eliminate the corrosive effect of the exhaust gases on ball bearings.

Two springs are used on the intake valve and three on the exhaust valve. All springs are made of round wire and helically wound with variable pitch coils in the same direction to promote valve rotation.

The crankshaft is of the two piece, clamp type design. The clamp proportions have been selected so that the tightening of the bolt will control stresses produced by the forcing of the

clamped end over the crank pin. The shaft is counterweighted in conventional proportions and the counterweights are forged integral with the shaft. The shaft which is hollow throughout the length, rides in three bearings, the ball thrust bearing and the two main ball bearings.

Connecting rods consist of one master rod and eight link rods, the master rod being of one piece construction machined from a chrome nickel steel forging and provided with a steel back high lead bronze bearing. To insure that the master rod piston receives proper lubrication when starting, the master rod is placed in one of the lower cylinders where it receives more oil at low speeds.

The link rods are of forged aluminum alloy articulated from the master rod with nitralloy link pins. Bushings in the link rod ends have been eliminated and the aluminum bears directly on the glass hard nitrided pins.

Aluminum alloy forged pistons are used. Care has been given to the rigidity of the piston pin bosses as well as to the piston as a whole. Four rings are used above the piston pin and one below.

The full floating piston pins which are of generous size and made of nitralloy, are prevented from scoring cylinder walls by the insertion of soft alloy plugs in the ends.

The crankcase assembly is built up of four components secured by studs and nuts: (1) the thrust bearing housing containing the thrust bearing and cam follower guides; (2) the main bearing plate supporting the front main bearing and cam drive assembly; (3) the crankcase proper, carrying the rear main bearing and is provided with the cylinder pads; (4) the rear accessories housing containing the drives for the magneto, distributors, oil pump, tachometer and generator. This last component also provides a mounting for the engine starter, and carries the alignment bearing for the accessories drive shaft. These parts are made from heat treated, cast aluminum alloy, with the exception of the main bearing plate which is an aluminum alloy forging.

The oil sump is of cast aluminum alloy. It is studded to the crankcase and thrust bearing housing and also acts as a housing for the oil strainer.

The accessories drive shaft is an alloy steel shaft, driven by a spline from the rear half of the crankshaft and runs in a ball bearing located in the rear accessories housing. This shaft carries the accessories drive gears and starter jaw.

A rotary induction system is employed. It consists of a cast aluminum impeller of large diameter secured to the crankshaft and rotates at engine speed. The mixture is carried from the impeller chamber to the cylinders through intake pipes radiating tangentially from the case.

Recent Aeronautical Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Fabric (adapted to cover wings of aircraft). William Colvin, Jr., Troy, N. Y. (1,965,542)

Improved wing structure. Giuseppe M. Bellanca, New Castle, Del. (1,965,790)

Airplane control device. Thomas H. Crissey, New Canaan, Conn. (1,965,793)

Inlet manifold for liquid fuel. Stephen A. Hasbrouch, New Haven, Conn., assignor to Pratt & Whitney Aircraft Co. (1,966,032)

Cowling ring. George A. Page, Jr., Freeport, and George E. Warren, Flushing, N. Y., assignors to Curtiss Aeroplane & Motor Co. (1,966,043)

Aircraft. Theodore M. Leka, New York, N. Y. (1,966,300)

Mounting for aircraft motors. Hiram C. Otwell, San Francisco, Calif. (1,966,309)

Propeller. George C. Walters, Jr., Flagstaff, Ariz. (1,966,366)

Propeller mechanism for aircraft. Frank Donohue, Jr., Brooklyn, N. Y. (1,966,382)

Landing light. Donald R. Bruner, Dayton, Ohio. (1,966,436)

Rotary vacuum wing or propeller for use on air, land, and water vehicles. Otto K. Quasi, Spokane, Wash. (1,966,461)

Inclinometer for airplanes. Cyrus O. Fritsch, North Brook, Ill. (1,966,714)

Navigational instruments. Victor E. Carbonara, Rockville Center, N. Y., assignor to Bendix Aviation Corp. (1,966,844 and 1,966,845)

Aircraft control system and apparatus for automatic control more particularly of aircraft. Waldemar Moller, Berlin-Zehlendorf, Germany. (1,967,155 and 1,967,156)

System of rotating wings controlled by automatic rudder. Giovanni Serragli, Florence, Italy. (1,967,329)

Propeller. John Squires, Hagerstown, Md. (1,967,435)

Variable-pitch propeller. Frank Ballew, Detroit, Mich. (1,967,461)

Aerial system (for aircraft). Harold H. Beverage, Riverhead, N. Y., assignor to Radio Corp. of America. (1,967,604)

Propeller. Vincent Bendix, South Bend, Ind., assignor to Bendix Research Corp. (1,967,735)

Propeller. George F. Houston, South Bend, Ind., assignor to Bendix Research Corp. (1,967,753)

Aileron control. Robert J. Minshall, Seattle, Wash., assignor to Boeing Airplane Co. (1,967,777)

Cantilever wing for aircraft. Barnes N. Wallis, Weybridge, England, assignor to Cicker (Aviation) Ltd., same place. (1,967,795)

Airplane rudder structure. Earl J. W. Ragsdale, Norristown, Pa., assignor to Edward G. Budd Mfg. Co. (1,967,901)

Automatic control for controllable-pitch propellers. Howard H. Couch, Dayton, Ohio. (1,968,029)

Training and testing device for aviators. Luther S. Rose, Langley Field, Va. (1,968,057)

Airplane wheel. Ernest F. Goodyear, Moxhall Park, Wishaw, and Joseph Wright, Stoke Park, Coventry, England, assignors to Dunlop Rubber Co. Ltd., Fort Dunlop, England. (1,968,076)

System of navigation and plant for carrying it out. William A. Loth, Paris, France. (1,968,085)

Bomb sight. Antonio Clementi, Vienna, Austria. (1,968,127)

Gun mount. Clem G. Trimbach, Kenmore, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,968,182)

Aircraft. Bert Smith, Denver, Colo. (1,968,227)

Wind tunnel. Elisha N. Fales, Haverford, Pa. (1,968,382)

Airplane. Curtis J. Magalis, McGaheysville, Va. (1,968,497)

Method of balancing propeller blades. John Squires, Hagerstown, Md. (1,968,540)

Compass. Harry H. Innis, Munhall, Pa., assignor to General Electric Co. (1,968,556)

Landing chassis for aircraft. Claude Dornier, Friedrichshafen, Germany. (1,968,637)

Propeller blade pitch gauge. John B. Kneip, lieutenant commander, U. S. Navy. (1,968,837)

Wind indicator. William M. Lanagan, Rantoul, Ill. (1,968,838)

Variable-pitch propeller. Howard C. Mem, Cleveland, Ohio. (1,968,844)

Air propeller. Joseph Toth, Budapest, Hungary. (1,968,918)

Aircraft sustaining unit. John H. Howe, South Orange, N. J. (1,969,077)

Device for giving luminous signals, particularly adapted for aviation purposes. Robertus J. Castendijk, Eindhoven, Netherlands, assignor to Carl Zeiss, Jena, Germany. (1,969,206)

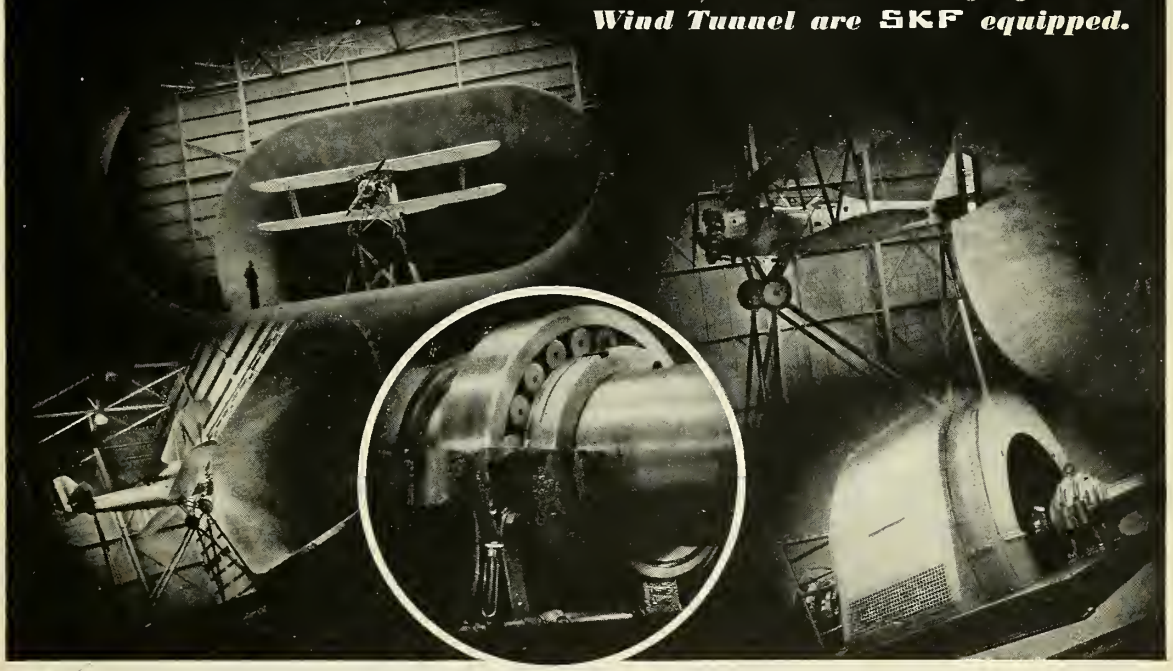
Propeller. Marshall A. Smith, jr., South Bend, Ind., assignor to Bendix Aviation Corp. (1,969,280)

Method and means for determining altitude from aircraft. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Co. (1,969,537)

Propeller hub. Albert Rupp, Berlin-Tempelhof, Germany. (1,969,664)

115 MILE GALE
RAGES ON SKF BEARINGS

Largest Anti-Friction Motors in the World . . . used in Langley Field Wind Tunnel are SKF equipped.



3263

PIONEERING engineers . . . men who do the things that never have been done before . . . seldom depend upon any but SKF Bearings. They know the stuff of which they're made. They know the organization that makes them. They know not only that they can depend upon the bearings to perform, but upon the organization back of them, for the most complete and authentic bearing counsel that is available today.

What does it matter that such bearings cost a little more? The point is that they *perform* and in a bearing, performance is the only thing that counts. It is not strange, therefore, that the National Advisory Committee for Aeronautics, in selecting the gigantic motors for the largest wind tunnel in the world, should see to it that they are SKF equipped.

SKF Bearings are built by the world's foremost bearing specialists . . . always *up* to the job . . . never *down* to a price.

ABOVE: *Largest wind tunnel in the world erected by National Advisory Committee for Aeronautics at Langley Field, Va. 115 mile gale for airplane testing is created by two 4000 H. P. electric motors each turning a 12" shaft on SKF Bearings.*

SKF INDUSTRIES, INC.
Front Street and Erie Avenue,
Philadelphia, Pa.

SKF
BALL AND ROLLER BEARINGS

PRIVATE FLYING and CLUB NEWS

Buffalo to Have Air Races

THE SECOND Annual Buffalo Air Races, under the joint sponsorship of the Buffalo Aero Club and the local Junior Chamber of Commerce are to be held at the Buffalo Municipal Airport, New York, on September 8 and 9.

Approximately $5,000 and many valuable trophies are to be awarded to the winners of the various events. Included as a featured race is an event limited to planes with engines of 550 cu. in. displacement, maximum. It is planned to have about four competitive events each day and to present to the audience some very fine aerial exhibitions. According to Frank McKay, the meet has been sanctioned by the N.A.A. as a regional affair.

Air Club in Ambitious Program

THE ST. JOSEPH Valley Aviation Club of South Bend, with headquarters at the Bendix Municipal Airport, has been reorganized under a non-profit charter granted by the state to develop phases of aviation not heretofore undertaken by flying clubs.

It is proposed to increase the membership to 500 or more, establishing a nominal fee, and taking in all persons interested in flying or any related activities. A library and reading room devoted to aviation progress is to be opened as soon as possible; nationally-known speakers are to be brought before the club and social affairs are to be developed with the aid of a women's auxiliary.

The club is authorized to purchase and own planes for club use, and to build a clubhouse. Dr. C. L. Snyder, of South Bend, is president.

Langstaff Appointed to Air Post

D. O. LANGSTAFF of Jefferson Parish, Louisiana, has been appointed state inspector of aviation by Governor O. K. Allen. Under an act of 1932 regulating aircraft, the inspector of aviation is authorized and directed to make regular inspections of aircraft and to promulgate provisions governing flying.

Second State Tour Scheduled

DATE OF the second state air tour to be sponsored by the Oklahoma City Aviation Club has been set for September 15-16, according to Moss Patterson, club president. The tour will include McAlester, Wilburton, Talihina, Heavener, Poteau, Okla., Fort Smith, Ark., Eufala, Muskogee and Okmulgee, Okla. This tour will complete inspection and official dedication of 38 new airports which, with about six additional ports on which improvements were made, represent an expenditure of about $250,000 of federal funds under CWA and FERA.

The first tour conducted by the club in June attracted more than 30 ships which visited 22 Oklahoma cities. Patterson estimated that at least as many ships will take part in the second tour.

SPORTSMAN PILOTS VIE FOR NATIONAL RATING

LEADING SPORTSMAN pilots of this country are competing in elimination trials to represent their respective states in the National Sportsman Pilot Championship Tournament to be held this fall. These state champions, one man and one woman from each state, will vie for the honor of being designated America's premier sportsman pilots. The tournament is being held under the auspices of The Sportsman Pilot Association.

Air Meet at Cape Cod Airport

THE I. J. FOX Air Carnival, held at Marstons Mills, Cape Cod, attracted a large gathering including many flyers from New England. After an air parade over Boston, a derby race was held between Boston and the Cape Cod Airport, with Joseph Burnett finishing first, followed by William Bowen and Mrs. Kenyon. A bomb-dropping contest precision-landing contest, sky polo, and woman's race were among the other features.

Stunting exhibitions by Crocker Snow and Mrs. Kenyon were also on the program.

21 Planes Make Air Tour

TWENTY-ONE PORTLAND, Ore., planes with as many sportsmen pilots, recently made a practice flight to The Dalles, Ore.

Among those who took part in the exhibition were: Cecil J. Pounder, Pounder Flying Service; Ray Schanhais, operations chief of the tour; George Howe, Rasmussen-Meadows Flying Service; J. H. Wildman; O. G. Barnum; Harold Wagner: Seth Davidson; Dr. H. Kyle; Stanley Harris; Jos. K. Terry, Bell Flying Service and L. H. Corder.

State Air Meet to Be Held

THE ANNUAL All State Air Meet of West Virginia will be held Sept. 1st. 2nd, and 3rd, at Jackson's Mill, Weston, West Virginia. The airport, on the site of the old Stonewall Jackson Farm, is a part of the State agricultural experimental station.

The meet is held annually in connection with the State Fair, and will be under the direction of H. A. Diekmann, manager of the airport.

Private Flyers Organize

IN THE SPRING of this year, several well-known private pilots undertook to organize a national association of private flyers to make private flying more convenient, less expensive and more enjoyable. They felt there was need for an organization which would accomplish these objectives, by sponsoring the private flyers viewpoint in such matters as governmental regulations and legislation, insurance and flying facilities; by providing useful information on airport charges, the conditions of fields and cross-country courses; and by representing the flyer in all other matters and problems which involve his interest. In the brief period of its existence, the Private Fliers Association (as the organization is known) has enrolled as members some of the most prominent non-commercial pilots. Any pilot or aircraft owner is eligible for active membership if he (or she) does not derive his principal income from piloting, instructing or renting airplanes, or running an airport. The Association is now compiling data and preparing recommendations to be presented to the Federal Aviation Commission in behalf of private flying. The Association recently established headquarters and clubrooms at the Savoy-Plaza Hotel in New York City.

Sales Trip Covered by Air

A 10-DAY sales trip was undertaken recently by Thomas C. Kyle, sales manager of the Muessel Brewing Co., South Bend, Indiana, in a Cessna monoplane, piloted by Rudolph Van Devere of the Indiana Air Service. The tour covered many states, reaching as far south as New Orleans. The brewing company has used airplane transport and promotional services frequently in extending the distribution of its product.

Girl Solos in Three Hours

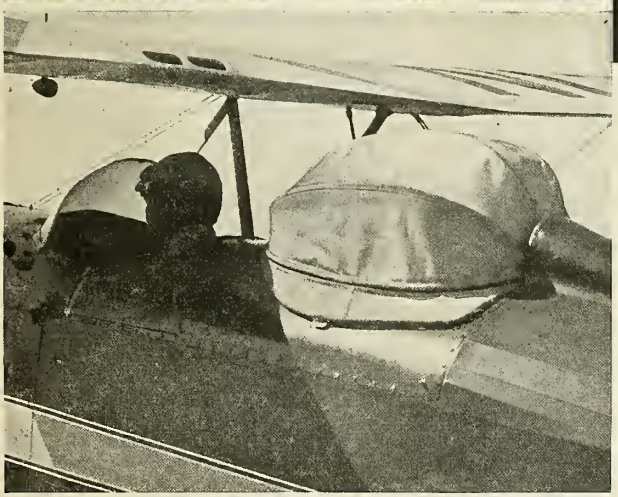
WITH NEARLY 50 pupils in training under the two air schools operating at the Bendix Municipal Airport at South Bend, Indiana, it remained for a 16-year-old girl to set a new minimum time record for her solo flight.

Miss Lois Greenwood soloed after 3 hours 15 minutes of instruction by Homer Stockert.

Girls Club Gives Exhibition Flight

TEN MEMBERS of the Chicago Girls Flying Club paid a visit to the Paul Baer Municipal airport, Fort Wayne, Ind., to give a flying exhibition. Most of the women drove to Fort Wayne in automobiles, and used local planes for their flying. A parade over the city was followed by stunt work at the airport.

(*Continued on following page*)



PHOTOGRAPHS: *Ryan students receive instruction in meteorology ● All Ryan transport students receive "blind" or instrument flying under hood ● The Ryan School is within easy walking distance of residence and business sections of San Diego ● Lindbergh Field is completely lighted for Ryan students' night flying instruction.*

RYAN
invites comparison

Let's consider facts:

THE terms "best—finest—most ideal" are meaningless in describing aeronautical schools unless the schools are definitely compared one with the other. For this reason the RYAN School suggests that prospective students compare the leading Department of Commerce Approved Schools point for point before making a definite selection.

"Advance enrollment deposits" are not required at RYAN. Those who prefer to come to San Diego and first investigate the school will be allowed the proper transportation refund upon enrollment. The school's instructive 40-page illustrated catalog is free—send for it.

Fall and Winter classes are now forming. Those who appreciate year 'round flying weather will he interested in knowing that in this city these terms are merely descriptive of the time, for San Diego knows neither Fall nor Winter Seasons.

RYAN SCHOOL OF AERONAUTICS,
Lindbergh Field, San Diego, California.
Gentlemen:

I am interested in the courses checked: please send additional information.

☐ Transport Pilot	$1795	☐ Mechanics Course	$175
☐ Limited Commercial	585	☐ WEEMS NAVIGATION	
☐ Private	585	Home Study Course	100
☐ Amateur	295	☐ Aircraft Welding	100

☐ Ryan deluxe Combination Course of Transport training plus new Ryan S-T high performance plane $4242

NAME ..... AGE.....

ADDRESS .....

CITY ..... STATE.....

U.S. DEPT. OF COMMERCE — Approved — HIGHEST RATING TRANSPORT

RYAN SCHOOL OF AERONAUTICS

Lindbergh Field

In Sunny SAN DIEGO, CALIFORNIA

(*Continued from preceding page*)

Seaplane Meet at Cape Cod Club

THE FIRST New England seaplane meet was held at the Oyster Harbors Club, Osterville, Mass., under the auspices of the club, with events including a parade over Cape Cod; bomb dropping, life saving; handicap races; stunting exhibitions and other contests.

The two lap race was won by James P. Whitall, with Guy A. Ham, Jr., second and J. Otis Beard, third. Winners of the three lap race were Whitall, Ham and Capt. H. Wincapaw, in that order. Two persons formed the crew for the life saving event. The object of the contest was to take off, land and retrieve a dummy dropped from a boat, taxying to shore with it, in the shortest time. George B. Post, won with a time of 1 minute 38 seconds.

In the bomb dropping contest, each pilot was to drop one bomb from not less than 100 feet; the target was a white circle painted on a raft. This event was won by Beard; Post was second with Mrs. Margo Tanner third. Beard in his Aeronca won the take-off contest, which was to go to the plane taking off in the shortest time. The prize was a cup, known as the Edo Trophy, donated by George Post. Guy Ham reached the 1000-foot level in the quickest time to win the altitude race.

The feature of the afternoon was a radio controlled stunting exhibition by Mrs. Theodore W. Kenyon in a Waco landplane, with Mr. Kenyon at the microphone. Later, Lieut. W. L. Foley of the Gloucester Coast Guard station gave an acrobatic exhibition in a Vought Corsair.

New Aviation Group Incorporates

TO ADVANCE aeronautics throughout the state of Washington, The Washington State Aeronautic Association has been duly formed and incorporated with headquarters at Wenatchee, Wash. Incorporators are Ray W. Clark, W. G. Ronald and D. A. Shiner.

Oregon Gets Air Director

DR. RAYMOND R. STAUB has been appointed by Governor Meier of Oregon to the State Board of Aeronautics.

The present membership of the board also includes Dr. Carl J. Bartell, L. B. Hickam, Charles Reynolds and Russell H. Lawson.

Aero Club Elects Officers

ASA ROUNTREE was elected president of the Birmingham Aero Club at a recent meeting. E. W. Stanford, Hayden Brooks, John Donalson and Blance Toney were elected vice-presidents, and D. E. Denny was elected secretary-treasurer. The following members were chosen to form the board of governors: Steadham Acker, Leslie Meadows, Harold Wood, Mall Lawson, James S Adair, James Anderson, W. R. Kent, Joe Brady, Odell Garrison, Paul Patterson, Jack Rhodes, Giddeon Wynne, Jr., William Donovan, A. R. Pryor, Harry King and Jack Moose.

59 PLANES TAKE 259 PERSONS ON AIR TOUR

THE THIRD annual good-will flight between Roosevelt Field and Montreal attracted 59 planes and 259 passengers who spent a week-end as the guests of the Montreal Light Aeroplane Club. The American fliers were greeted at the St. Hubert Airport by a crowd of Canadian pilots and civic authorities.

Malone Wins Marion Feature

JAMES A. MALONE, flying a Stinson monoplane, won the 100-mile cross-country derby, the feature of the Southern Illinois Air Races held at Marion, Ill., under the auspices of the local American Legion post. The air races were part of the ceremonies held in connection with the opening of Marion's new airport.

Fred Ludwig in a Buhl Bullpup was second, and Virgil Russell was third.

Army planes from Scott Field, Belleville, Ill., piloted by Lieutenants W. Richie, I. R. Selby and L. S. Fulwilder, opened the program with a series of maneuvers and Art Gobel assisted in the airport dedicatory ceremonies.

Plane Used to Run Walnut Orchard

C. C. ANDERSON, manager of a 773-acre walnut tract ten miles east of Stockton, California, runs the orchard from the air. Daily during the growing season Anderson flies over the orchard at 600 or 700 feet to check the flow of water in the irrigation ditches, the spraying operations, the appearance of the trees and other details. He can do in one hour or two a job that would require a week or more of steady hiking.

Inspecting the irrigation system on foot is out of the question for there are ten miles of concrete pipelines and more than 300 miles of contour ditches between the rows of trees. Water is supplied by eight electric pumps ranging from 20 to 50 horsepower.

Wisconsin Air Meet to Be Held

UNDER THE sponsorship of the Myron C. West Post of the American Legion, the Southern Wisconsin Air Derby will be held at Beloit, Wis., September 8 and 9. Harry W. Lewis, Ted R. Fish and Arnold M. Marquis will direct the meet.

Features of the derby will be a 100-mile cross-country race, a free-for-all race, a stunting contest and an altitude race.

Women Hold Air Meet

SPONSORED JOINTLY by the Women's National Aeronautical Association and the Ninety-Nines, the First Women's National Air Meet was held at the Dayton Municipal Airport, Vandalia, Ohio, August 4-5.

The featured events consisted of two races. In addition, there were exhibition parachute jumps, and contests in precision landing and bomb dropping.

The meet opened with a twenty-mile handicap race sponsored by the Waco Aircraft Corp. Twelve pilots entered this race, with Jeanette Lempke coming in first and Annette Gipson, second.

The contest in precision landing followed the Waco race. The winners of this event were: first, Ellen Smith, who landed 3 feet 7 inches from the mark and Mrs. C. F. Kolp, second.

The concluding event of August 4th was an exhibition parachute jump by Miss Lucile H. Parker.

On August 5th, the main event was the fifty-mile handicap race of five laps around a ten-mile course, won by Helen Richey. Alma Arline Davis was second and Gladys O'Donnell, third. Edna Gardner who was disqualified has filed a protest with the N.A.A.

The other contest of the afternoon was the bomb dropping contest, which was won by Mrs. Kolp.

20 Planes Make Long Tour

THE SALT LAKE City Chamber of Commerce air armada completed a 1,000-mile swing around the state airports with 20 private planes in the entourage.

The air armada was in charge of a committee composed of Ray L. Peck, manager of the Thompson Flying service, who was flight commander; Winston Ellerbeck, of the Chamber of Commerce of Salt Lake City aviation committee and Dean Brimhall, who was in charge of the CWA airport work.

Among the communities visited were: Duchesne, Vernal, Myton, Price, Green River, Moab, Provo, Torrey, Kanab, Cedar City, Milford, Richfield, Ogden and Logan.

Club Officers Elected

AT THE annual election of officers of the Wing Over Club of Beaumont, Inc., Beaumont, Texas, Larry J. Fischer was re-elected president. Other officers chosen were James Marshall, vice-president; Burton Holton, secretary-treasurer and Luther Coruthers, B. F. Edgar, Ralph Hall, O. K. Hargraves and Wiley Sullivan, directors.

The club is entering its third year and now includes 50 pilots. It has helped aviation immeasurably in Texas and only recently was instrumental in the erection of an air marker on one of the buildings in the city.

New Transport Rules Promulgated

REVISIONS OF regulations pertaining to air transport operation and aimed at making air transportation safe, are to become effective the first of this month as a result of a two-day conference held in Washington between the airline operators and officials of the Bureau of Air Commerce.

The major proposals dealt with the creation of the position of air dispatchers whose names and qualifications would be on file with the Bureau; breaking up of airways into divisions, with pilots and equipment operating solely over a particular division; an employment code limiting flying hours; limitation of above-the-cloud and fog flying operations and permission to airlines, where properly equipped, to fly at high altitudes.

The outstanding effect of the new rules is in the limitation of operations of multi-motored and single engined transports. Above-the-cloud and fog flying has been confined to planes with more than one engine capable of continuing flight after the failure of one engine. Single-engined planes are restricted to daylight flying under such conditions that the ground is visible at all times or there is sufficient ceiling under the clouds for them to effect a safe forced landing in the event of engine failure.

The increased range, speed and safety of the multi-engined airliner is recognized in the greater distances they are permitted to fly through or over bad weather areas.

An airway was described as a path 50 miles wide and extending 25 miles beyond either terminal or division; pilots are now confined to such airways and cannot deviate from them.

United Passenger Traffic Increases

AN INCREASE of 42.6 per cent in number of passengers carried by United Air Lines during the first seven months of 1934, over the volume transported during the corresponding period of 1933, is reported by the company's officials.

A total of 83,409 revenue passengers traveled over the New York-Chicago-Pacific coast and other United routes between January 1 and August 1 of 1934, against 58,486 revenue passengers carried in the same period last year.

MAIL OPERATORS BETTER 98 PER CENT EFFICIENCY

DURING JUNE, air mail operators in the United States flew 1,909,984 miles, maintaining an operating frequency which was 98.37 per cent of the total miles scheduled. During that period, a perfect schedule was maintained on 11 of the 25 routes flying. United flew 100 per cent on one route, American Airlines on three, Wyoming on two while General Air, Braniff, Long & Harmon, Alfred Frank and National Airways also flew all miles scheduled.

Pan American Traffic Reaches Peak

SETTING A new high record for international air travel, Pan American Airways, for the first quarter of this year, carried 29,139 passengers, 30 per cent over comparative figures in 1933. Passenger miles totaled 9,793,818 an increase of 36 per cent over the first quarter of 1933, and a total which places the company first among all international air transport systems.

During the period under consideration 1,374,978 pounds of mail and express were carried, a gain of almost 325,000 pounds over 1933. Practically all routes in the system reported increases for the first quarter.

Overnight Coast Service Opens

LINKING THE Atlantic and Pacific Coasts together with regular overnight air transport schedules, Transcontinental & Western Air, Inc., has inaugurated a daily schedule between New York and Los Angeles in new TWA-Douglas luxury airliners.

Every afternoon at 4:00 and 5:30 p.m., Douglas fourteen-passenger transports depart from New York and arrive in Los Angeles at 7:00 and 9:15 a.m., respectively, the next morning. The first schedule serves Chicago, Kansas City and Albuquerque en route while the second makes stops at Pittsburgh, Chicago, Kansas City, Wichita, Amarillo and Albuquerque.

Eastbound, the first plane leaves at 4:00 p.m. and before arriving in New York at 10:55 a.m., stops at Albuquerque, Kansas City and Chicago; the second eastbound Douglas leaves at 9:00 p.m., and stops at Albuquerque, Amarillo, Wichita, Kansas City, Chicago and Pittsburgh arriving in New York at 4:57, the following afternoon.

Although the inaugural service was instituted with one plane a day in each direction, the great demand for accommodations compelled the addition of the second and later schedule. It was revealed that bookings were being made a week in advance with waiting lists on many of the flights.

Air express traffic is increasing rapidly on these flights while newspapers are being shipped to guests in Los Angeles, Chicago, and New York hotels permitting visitors to read their home papers 2,500 miles away the same day they are printed.

Transcontinental and Western Air, carries no mail on these flights, that cargo coming in eight hours later with TWA, Inc., a new company formed to transport the mail.

Photos courtesy New York Sun and Ambassador Hotel

Inaugurating TWA's overnight coast-to-coast service with new Douglas luxury airliners. Passengers at Newark before the 4 p.m. departure and at a 7 o'clock breakfast the following morning in Los Angeles

Express Rates Reduced

NEW AIR express tariffs and a rezoning of the United States became effective August 15 over routes flown by companies affiliated with General Air Express. A reduction in the cost of shipping as well as the introduction of a new minimum rate was announced at the same time by Railway Express Agency.

The former rate of $1.25 to $1.80 minimum for one pound or less has been reduced to 85 cents for 12 ounces or less and $1 on shipments up to one pound; shipments in both minimum classes are to any point in the U. S. All rates include pickup and delivery by Postal Telegraph or Railway Express.

The country is now divided by General Air Express into 24 zones of 100 miles each instead of 59 zones of 50 miles each, effecting a saving at practically every point.

Airlines affiliated with General Air Express are Eastern Air Lines, American Air Lines, Transcontinental and Western Air, Inc., Pennsylvania Airlines & Transport Corp., Northwest Airlines, Inc., and Long & Harmon, Inc.

Those affiliated with the Railway Express Agency include United Air Lines, General Air Lines, Northwest Airways, Alfred Frank, Hanford Tri State, Bowen, Wyoming, Braniff, Central, Pacific Seaboard, and Robertson.

St. Louis Gets Better Mail Service

A NEW air mail schedule which provides for direct St. Louis-New York air mail service and a later closing hour on mail is now operating.

A new schedule, the result of efforts made by the St. Louis Chamber of Commerce Air Board, calls for the departure of planes from St. Louis at 7:50 p.m., daily with arrival in New York at 4:45 o'clock the following morning in time for the first delivery there.

Since resumption of air mail service, mail was flown to New York via Chicago, the plane leaving St. Louis at 6:20 p.m., which made the closing time 5:15 at the St. Louis postoffice. The earlier closing was found unsatisfactory and a campaign for improved schedules was started by the civic group. The closing time under the new schedules for eastbound mail is 6:45 p.m.

Westbound, the mail planes leave New York at 10:00 p.m., daily and arrive in St. Louis at 5:10 a.m.

808 pounds of machinery, constituting the largest international air express shipment, being loaded aboard a Curtiss-Wright Condor for the start of a flight to South America

Purchase of Transport Fleet Planned

GENERAL AIR Lines is making arrangements for the immediate purchase of a $300,000 fleet of high-speed, all-metal, low-wing transports seating 10 to 14 passengers for use over its 700-mile route between San Diego and Salt Lake.

Specifications call for a cruising speed of between 190 to 200 miles an hour, reducing the company's flying time from six to approximately three and a half hours. The ships are to be bi-motored and so powered that flight can be maintained on one motor at prescribed altitudes. Testing will include flights over the Great American desert under actual flying conditions of various atmospheric disturbances. Load tests will be conducted at various altitudes on one and both motors. Interior of the planes calls for full reclining chairs with lavatory and cupboard space while the noise level must be equal or below a modern Pullman car.

Charles N. James, operations superintendent is contacting manufacturers relative to a choice of equipment.

New Radio Equipment Installed

NEW VOICE transmitting equipment has been installed in the American Airlines central division operations building, Lambert-St. Louis Municipal Airport.

A 400-watt short wave transmitter for working airplanes and sending messages to ground stations, and a 250-watt phone transmitter for code messages were installed. Both transmitters are capable of operating on four different frequencies. This equipment replaces 50-watt transmitters temporarily used.

Aerial Tour Offered

ARRANGEMENTS MADE between Pan American Airways, the Furness Prince Lines and the Grace Line have resulted in offering a 17,000-mile, six-week cruise by plane and steamer around South America. Thos. Cook & Son—Wagon-Lits, Inc., are cooperating in making this tour possible.

Three trips are being offered, one leaving New York September 11, another October 9, and the third November 6. The "Brazilian Clipper" S-42 will be used from Miami to Rio de Janeiro; there a boat will be taken to Buenos Aires; then another Pan American plane to Valparaiso where another steamer will make the return trip to Miami. Trains will be used between Miami and New York.

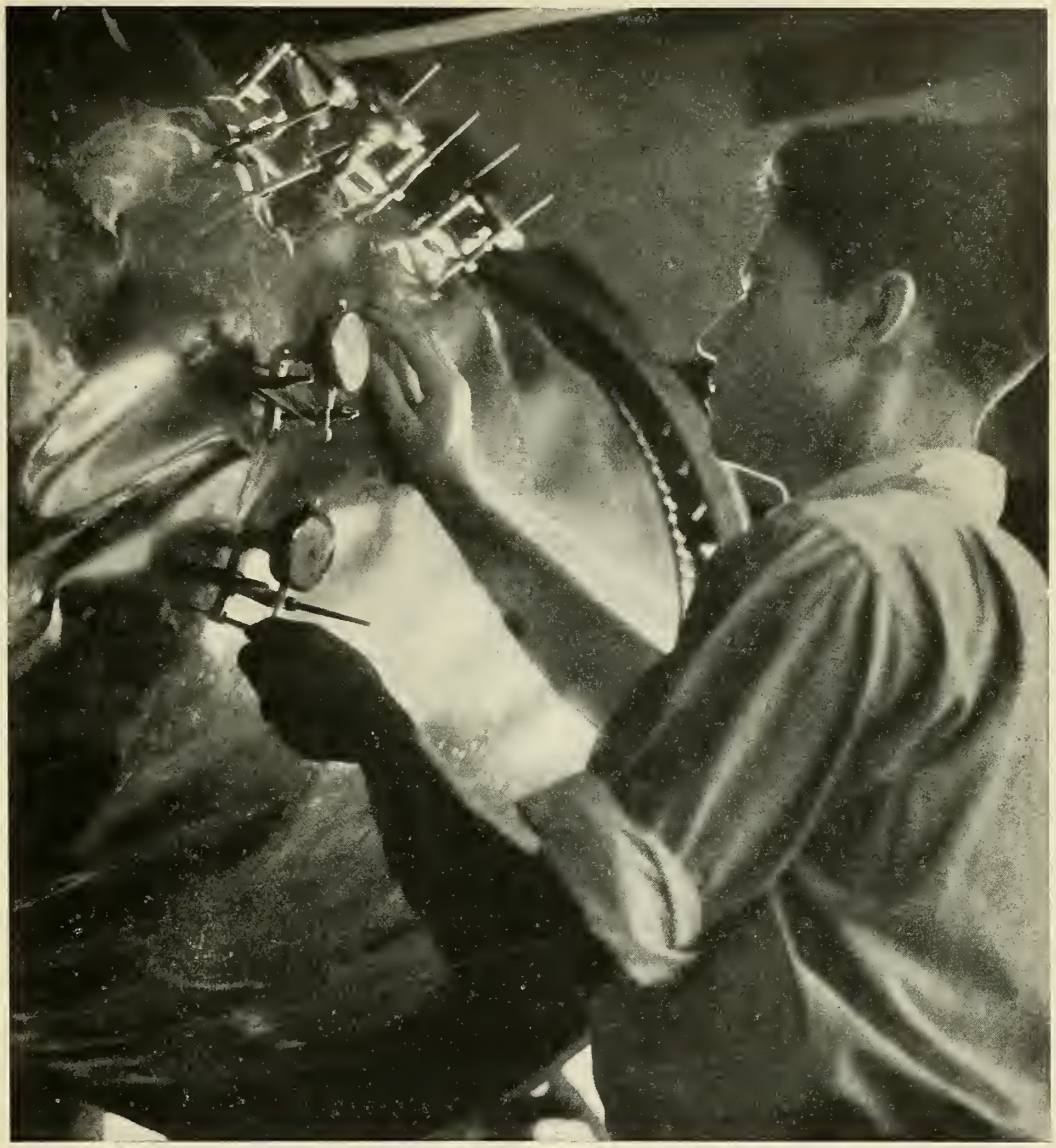
Each trip will include a visit to 21 countries, shore excursions, sight-seeing parties and individual trips.

Excursion Rates Attract Business

EASTERN AIR Lines, Inc., has demonstrated that excursion trips by air can be as attractive to air passengers as to travelers by steamship and railroad. This airline recently instituted a 30-day excursion rate over its New York-Atlanta-New Orleans route, and traffic has gained 80 per cent since it began.

In analyzing the increased passenger volume, Eastern Air Lines finds that more than 50 per cent are business travelers such as company executives, merchandise buyers and salesmen, while the rest are professional men, clergymen and pleasure travelers.

(Continued on following page)



HE'S FROM MISSOURI . . .

• Testing experts in the Boeing plant take nothing for granted — they have to be shown! Stresses and strains are computed mathematically but are verified by tests on full size specimens. Proof is the demand! Boeing Airplane Company, Seattle.

BOEING

• BOEING HAS ALWAYS BUILT • TOMORROW'S AIRPLANES TODAY

NRA WE DO OUR PART

(*Continued from preceding page*)

S-42 Flies To South America

CARRYING NINETEEN passengers and a crew of eight, the Sikorsky S-42 took off from Biscayne Bay, Miami, on August 16 to begin the first leg of its maiden 15,000-mile flight to South America for Pan American Airways.

After stopping at Port-au-Prince, San Juan, Georgetown, Para and Natal, the S-42 landed at Rio de Janeiro where Senora Vargas, wife of the Brazilian president, christened it. Remaining in Rio for a few days, the flying boat again took off and proceeded to Buenos Aires landing there two days ahead of the former schedule of eight days between Miami and that city.

The passengers consisted chiefly of prominent publishers, officials of Pan American Airways and Eugene Vidal. Chief Pilot Ed Musick was at the controls of the four-engined ship the greater part of the flight.

At the take-off from Miami, the plane lifted a useful load of more than eight tons, including 1240 gallons of fuel, almost 500 pounds of oil and 700 pounds of equipment.

New Schedule Inaugurated

PROVIDING KANSAS City with its only afternoon departure for Chicago, Cleveland, New York and other eastern points, United Air Lines inaugurated on August 1, a new schedule with departure from Kansas City at 2:15 p.m. and arrival at Chicago at 4:55 p.m., Cleveland at 8:35 p.m. and New York at 11:25 p.m. The southbound schedule departs from Chicago at 5:25 p.m. and reaches Kansas City at 8:30 p.m., for overnight train connections to points in Missouri, Oklahoma and Texas. Moline, Ill., and Burlington, Iowa, are served with flag stops.

The new schedule also provides for a direct United connection from St. Joseph, to connect with the plane leaving from Kansas City.

Texas-Louisiana Service Starts

ROBERTSON AIRPLANE Service Co., is now providing daily mail service over the Houston-New Orleans airway.

In addition to Houston and New Orleans, the route serves Baton Rouge and Lake Charles, La., and Beaumont, Texas. Three planes were put into operation.

Robertson's home office is at Lambert-St. Louis Municipal Airport, St. Louis.

Salt Lake Traffic Heavy

PASSENGER TRAFFIC through Salt Lake airport reached a new high for the year when 170 passengers checked in at the airport in a single day. Traffic to both east and west points is increasing appreciably, airport officials report.

A new schedule through Salt Lake City was announced by United Air Lines, with four schedules daily from the east, three being coast-to-coast and the fourth from New York to Salt Lake City.

UNITED AIR LINES FLIES 70,000,000 MILES

UNITED AIR Lines passed the 70,000,000-mile mark in July, of which approximately 33,000,000 miles were flown at night. The record was established during the company's eight years of operations. With increased passenger-carrying activities, United planes will fly 15,000,000 miles this year, the equivalent of the first three years of operations.

Through Condor Service Offered

CURTISS-WRIGHT Condors have been placed in service by Eastern Air Lines between New York, Birmingham and New Orleans. Under the old system plane changes were made at Atlanta.

New Company Formed

UNITED AERIAL Surveys, Inc., of Omaha, Neb., has filed articles of incorporation, stating an authorized capitalization of $25,000. R. E. Davis and W. W. Wenstrand are managing the new enterprise.

Air Markings Required

LIGHTS AND other signals for the protection of air navigation are now required on bridges, causeways, transmission lines and other structures over navigable waters of the United States, according to the Bureau of Air Commerce, Department of Commerce. Types of markings to be used are to be prescribed by the Secretary of Commerce, while responsibility for installation and maintenance of the lights and signals is charged to owners or operators of the bridges or other structures.

The Corps of Engineers, War Department, which issues permits for all structures crossing navigable waters, has stipulated that if the display of lights and signals on any work authorized is not otherwise provided for by law, such lights and signals as may be prescribed by the Bureau of Lighthouses, Department of Commerce, shall be installed and maintained at the expense of the owner.

On this authority, the Department several years ago issued "Recommended Standards for Marking Obstructions to Air Navigation." Clothed with more direct and explicit authority and jurisdiction, the Bureau of Air Commerce now is studying the entire matter with the view to promulgating regulations to carry out the terms of the new law passed by the last Congress.

Electra Makes 91 Trips in Month

THE NEW Lockheed *Electra* passenger plane, placed in service June 1st on the Twin Cities-Chicago route by Northwest Airlines, Inc., flew the equivalent of one and one-fifth times around the world the first month of operation, according to Croil Hunter, vice-president and general manager of the airline.

The *Electra* made 91 one-way trips from June 1 to July 1, flying a total of 31,820 miles. The average passenger load for the ten-place plane was 8.5 persons.

The twin-motored airliner flew an average speed of 174 miles from takeoff to landing, while the average actual speed in the air was 192 miles an hour. The plane flew at an average altitude of 4,243 feet and consumed 4.2 gallons of gasoline per hour.

Mail Manager Chosen

C. W. H. SMITH has been appointed mail traffic manager for Eastern Air Lines, Inc., and will immediately take charge of air mail development under L. Edwin Gill, vice-president in charge of traffic.

Mr. Smith's work will include supervision of mail handling by airline employes at airports, contacting postmasters and Post Office Department officials regarding details of the company's work as a mail carrier, creating closer coordination of connecting schedules where possible and similar duties.

He has been employed in air transportation since April, 1926, when he joined Western Air Express as general traffic manager.

Airline Ticket Office Opened

EASTERN AIR Lines, Inc., has opened a city ticket office and waiting room in New Orleans, La. The office is located in the downtown section at 211 St. Charles St., adjacent to the St. Charles Hotel. Sam Wilkes, city traffic manager, makes it his headquarters.

Eastern Air Lines now has city ticket offices in New York, Washington, Jacksonville, Miami and Atlanta.

Beacon Supply Base Established

A SUPPLY depot for lighting equipment for the St. Louis-Tulsa lighted air route has been established at Springfield, Mo., where W. S. Kenyon is in charge of the work for the Department of Commerce.

Emergency landing fields are scheduled for about every 50 miles, each being about 125 acres, and equipped with a radio beacon and lighted boundaries. Neosho, Mo., is one point already selected. Revolving beacons are to be established every fifteen miles, and sites are being arranged for them.

Navy Force of 2100 Planes Sought

THE NEXT Congress will be called upon to pass on a program now being prepared by Representative Vinson of the House Naval Committee in cooperation with the Navy Department calling for a new five-year naval air expansion plan.

The projected program will call for construction up to 2100 naval planes already authorized by Congress (but not appropriated), for development of the Philadelphia aircraft factory and an increase in the facilities of the Pensacola training station.

Mr. Vinson said a definite program was needed for the increase of the naval air force and that a large number of reserve planes are necessary for the aircraft carriers built and building.

Naval Air Station Improved

THE SAND Point Naval Air Station, north of Seattle, will be of vastly improved service to this section as a result of new aerial defense plans for the Pacific Northwest now being carried out by the Navy. Rear Admiral Albert W. Johnson, commander of the aircraft base force, who was in Seattle recently with two squadrons of planes for maneuvers in Alaska, recommended stationing two squadrons permanently at the Point and said that with the improvements now completed there, the airplane carriers of the Navy will hereafter base their planes at Sand Point while in drydock at Bremerton.

St. Louis Unit in Maneuvers

EIGHT PLANES of the United States Naval Reserve Air base, St. Louis, with Lieut. T. B. Williamson, base commander in charge, participated in the air maneuvers at the Great Lakes Naval Training Station last month, three of the ships remaining to participate in air gunnery and firing target practice. The three ships were commanded by Lieuts. F. E. Wells, John W. Geppert and Fred Fisher.

The squadron's flying equipment consists of four Helldivers and Fledglings.

Lieut. Frank Welds is executive officer in charge of the division with headquarters at the Lambert-St. Louis Municipal Airport.

NAVY BALLOON WINS ELIMINATION RACE

LIEUT. CHARLES H. Kendall and his aide Lieut. H. T. Orville won the privilege of participating in the Gordon Bennett Balloon Race at Warsaw, Poland, late this month when they piloted the Navy entry from Birmingham, Ala., to Commerce, Ga. (206.4 miles), to win first place in the National Elimination Balloon Races.

Army Planes Back from Alaska

FOURTEEN OFFICERS and nineteen enlisted men landed ten bombers at Bolling Field, Washington to complete one of the greatest massed flights in the history of the Army Air Corps. The flight approximated 10,000 miles and was in the nature of a training and map taking expedition. The return flight included a 943-mile non-stop hop from Juneau to Seattle, while previously the planes had made a number of reconnoissance flights from Fairbanks.

Naval Aircraft Factory to Be Enlarged

TO PERMIT construction of 10 per cent of the 1,184 planes needed to equip the treaty Navy authorized by the Vinson Bill, the Naval Aircraft Factory at Philadelphia will be enlarged, with $2,700,000 going into the work.

Of the $40,700,000 allocated to the Naval building program, $5,500,000 will be used for the construction of 225 planes, representing the first year's increment in the five-year program.

The Bone amendment to the Vinson Bill directs that not less than 10 per cent of the aircraft, including their engines, must be constructed in government aircraft factories or other plants owned and operated by the government.

National Guardsmen at Ft. Riley

SEVEN DOUGLAS observation ships of the 35th Division Aviation Missouri National Guard participated in the annual two weeks' encampment at Fort Riley, Kansas. Major Phil R. Love commanded the division which worked with the artillery units in adjusting artillery fire and in making aerial photographs.

The 35th division includes the 110th observation squadron, the 110th photo section and a medical detachment.

Army Ships at Dedication

THE MISSOURI National Guard Air Squadron, with seven planes under command of Major Phil Love, flew to Nevada, Mo., recently for the dedication of the city's new 60-acre municipal airport, one of the first in the country to be finished by CWA labor. Brig. Gen. E. M. Stayton and Adjt. Gen. Harold Brown also attended the exercises.

Foulois Asks 1000-Plane Program

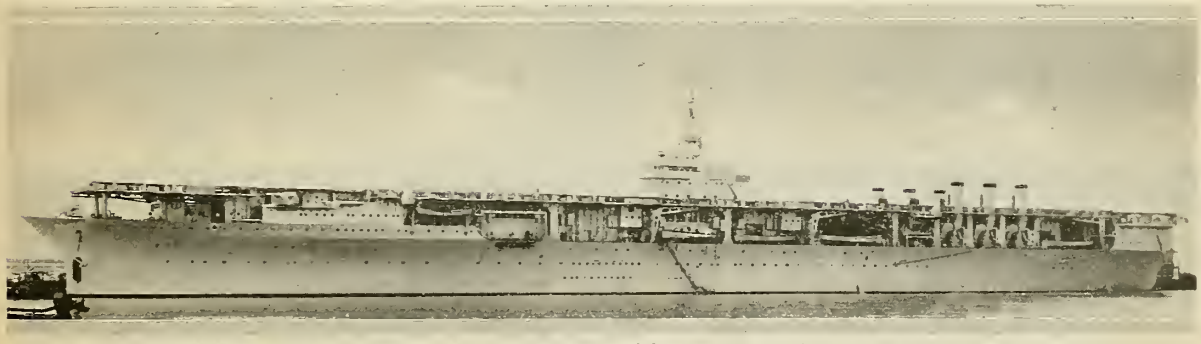
AIMED AT giving the U. S. Army Air Corps 2340 planes as recommended by the Baker Board, a 1936 program calling for the purchase of about 1000 planes has been submitted to the General Staff by Major Gen. Benjamin D. Foulois.

It is understood that the corps will concentrate on buying bombers, pursuit and attack planes, but it was pointed out that since the 1936 program was dependent upon Congressional appropriations, it was doubtful whether all the planes could be purchased during 1936.

Secretary of War Woodring has already sent out or prepared invitations for bids on about 450 planes to be purchased during the current fiscal year and in 1935 with appropriations already made.

Hensley Field Lease Renewed

THE U. S. Army Air Corps lease on Hensley Field in Dallas has been renewed by the city council for another year, or until July 1, 1935. The field is one of the outstanding reserve officers' training centers in the country and particularly for the Eighth Corps Army area.



The U. S. S. Ranger, newest aircraft carrier, as she returned from one of her shakedown cruises in the Atlantic

Roosevelt Students in Air Meet

TWELVE STUDENTS of the Roosevelt Aviation School participated in a competitive air meet at Roosevelt Field, Mineola, New York.

Two engraved trophies were awarded, one going to Thomas W. Feeney, who won the spot landing contest and the other going to A. Russell Kurt for winning the bomb dropping contest. Both winners flew Fleet planes.

Among the demonstrations on the program was an inverted flight and acrobatic exhibition by Al Williams.

38 New Students at Boeing

FOLLOWING THE closing of registration for the summer quarter at the Boeing School of Aeronautics, Municipal Airport, Oakland, Calif., it was disclosed that 38 students, representing 15 states and one territory of the Union began aeronautical training.

Previously, exercises for the 17th graduating class were held at the airport where the graduates were addressed by Prof. J. W. Miller of the University of Washington and R. D. Bedinger of the Department of Commerce.

Parks Plans to Increase Tuition

EFFECTIVE October 2, 1934, costs of attending Parks Air College, E. St. Louis, Ill., will be increased from 10 to 20 per cent. The increasing price of materials, food and equipment was offered as the reason for the added cost of training.

Students are being offered an opportunity of enrolling previously to October 2, with no extra charge made after that date. A new regular term starts on October 1.

Only recently the school augmented its training equipment by buying two new Kinners and a Waco cabin job.

48 Students Enroll in Jones School

TOTAL ENROLLMENT in the Casey Jones School of Aeronautics reached more than 200 students when 48 new students signed up for attendance in new classes which will open the second of this month.

Of the new students, 28 will attend the day classes; 20 are night students. Eighteen have signed for the two-year engineering course.

According to Casey Jones, the enrollment is an increase of approximately 50 per cent over any previous month's figures and can be attributed in part to the opening of the school's new quarters.

AVIATION COURSES GIVEN BY MILITARY CAMP

CAMP GREENBRIER, Inc., Alderson, West Virginia, conducted by the Bordentown Military Academy, Bordentown, New Jersey, has included the study of aviation in its operations this season. Arrangements have been made with the Rising Sun Aircraft School, Inc., Philadelphia, Pa., to give a short course in autogiro mechanics with David McMenamin in charge.

Ryan Students Graduated

STUDENTS WHO recently completed courses at the Ryan School of Aeronautics, San Diego, Calif., were awarded their diplomas, six of them in the transport category, two in the private classification, one in the amateur course and six in the mechanics course.

The school reports that since the beginning of the year, it has enjoyed one of its largest student enrollments.

More Planes Added to Flight Department

A FORD model 5AT-D Pratt & Whitney Wasp-powered tri-motored transport and a Boeing 40-B Hornet-powered cargo plane have been added to the Boeing School of Aeronautics' fleet, making a total of 11 units operated by the Flight Department in pilot training.

Twenty hours of tri-motor flying as co-pilot and first pilot will now be given to Airline or Special Airline Pilot students. Transport pilots wishing to obtain a rating for multi-motored ships may arrange for check and first pilot time. Director of Flight George Myers and his assistant, LeRoy Gregg, have prepared a schedule for the tri-motor flight training.

The Boeing 40-B is equipped with all instruments and radio accessories needed to practice "blind" landings, following the newly-installed Bureau of Standards landing beam beacon located at Oakland Airport. Its use will be shared by Boeing students and the flying personnel of United's Oakland Division.

School Plane Nears Completion

THE AERONAUTICAL University, Inc., Chicago, Ill., reports that the low-wing, two-place ship of new design they are building is nearing completion. It will be powered with a recently developed two-cycle engine of more than 100 h.p.

Bruce Smith, Dean of the Engineering Department, has charge of the design, and the entire engineering class has participated in the development and construction work.

At the Travel and Transport Building, in the Century of Progress Exposition, the school has taken space where it is displaying cutaway Wasp and other radial engines.

New Courses Offered at Spartan

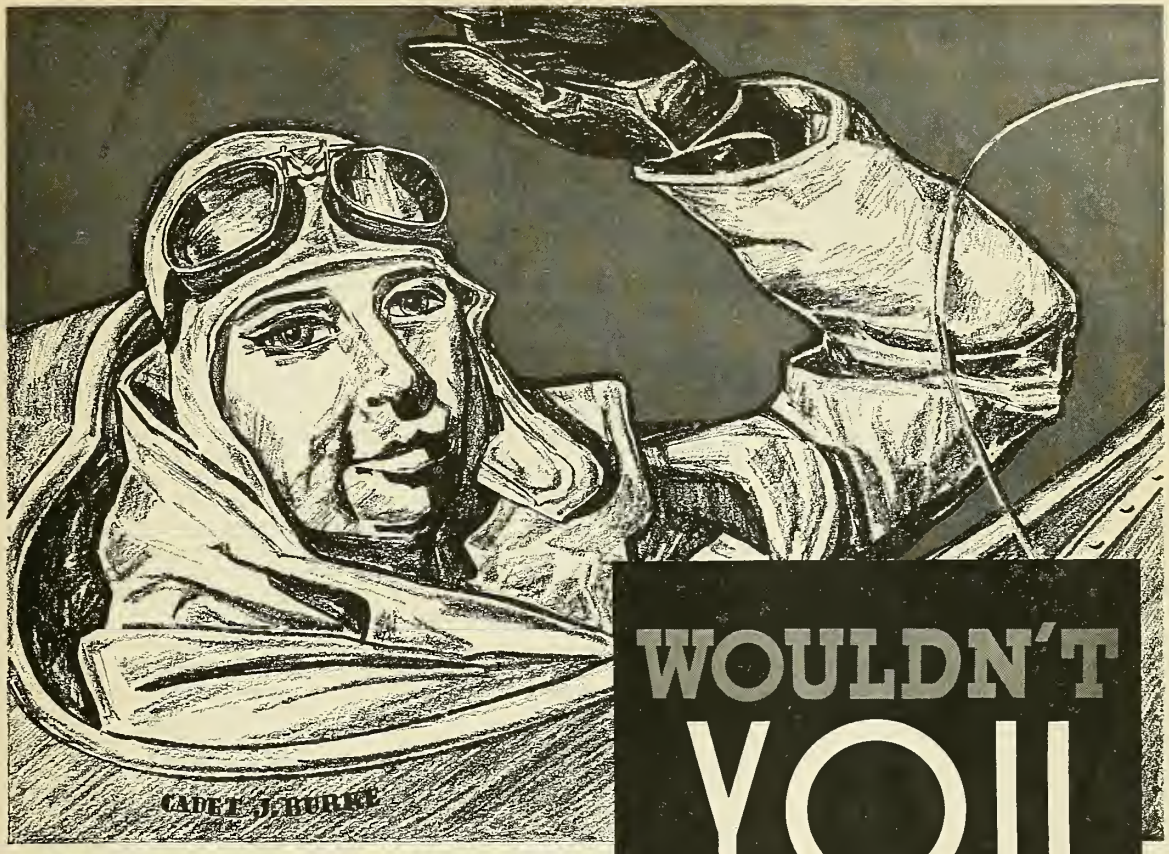
SPARTAN SCHOOL of Aeronautics, Tulsa, Okla., incorporated two distinct features in its Special Transport Course for those students who desire to become test pilots and also to those who contemplate becoming flight instructors. Both are included at no additional cost and are taken at the same time with the course.

With the opening of the fall term at the Oklahoma Military Academy, students enrolled in that school will have the opportunity to take aviation mechanics courses along with their regular academic subjects. This is made possible through the affiliation of the Academy with the Spartan School. Students will attend the aviation classes in the new hangar, recently completed at the Will Rogers Airport in Claremore.

83 Take Summer Air Courses

CURTISS-WRIGHT Technical Institute of Aeronautics, Grand Central Air Terminal, Glendale, Calif., has enrolled 23 high school teachers from various points in California who are taking special vocational teacher training courses. All of them report particularly heavy interest among their students in all branches of aeronautics—and their summer vocational training courses are expected to take ample care of the rapidly increasing demands being made on the high school faculties by the growing number of air-minded students.

The engineering class at the school has designed a small single-place airplane equipped with an Aeronca engine.



WOULDN'T YOU LIKE TO BE *in his place?*

This new SPARTAN *Catalog*

FREE

Tomorrow Aviation promises to become one of America's FIRST Industries. YOU can occupy a key position in this great growing industy if you are properly trained today! Send for a copy of the new SPARTAN Catalog, over 50 pages describing in detail SPARTAN 3☆☆☆STAR Courses of Aeronautics giving prices and complete detailed costs of ALL living and miscellaneous expenses while at the School. A FREE copy is waiting for you, send for it today.

Spartan School of Aeronautics

Tulsa, Oklahoma P. O. Box 2649

AFFILIATED WITH OKLAHOMA MILITARY ACADEMY
WILL ROGERS AIRPORT, CLAREMORE, OKLA.

FLY WITH THE DAWN PATROL

250 Michigan Cities Want Ports

WITH WORK drawing to a close on most of Michigan's 53 airport projects under the federal relief program, the State Board of Aeronautics is focusing attention on some 250 other Michigan communities which also want airports.

According to Floyd E. Evans, State Director of Aeronautics, work will be completed this fall on perhaps 45 out of the 53 current projects. Thirty of these projects are entirely new fields; the remainder are projects which include improvements in existing fields. As these are finished, new fields will be started to take their place on the program and at least 25 new projects will probably be started this fall.

Only about a half-dozen of the current airport projects will remain unfinished when winter arrives, including Lansing, Jackson and Flint, where in each case the development is extensive.

Five of the 53 current projects, have been completed at a total cost of about $58,000, according to Evans. These are: Muskegon, Adrian, Sault Ste. Marie, Midland and Ishpeming.

Since CWA appropriations ended and the program transferred to the FERA, only four projects covering new fields have been added. They are at Negaunee, Hillsdale, Rogers City and Benton Harbor.

Dallas Retains Bureaus

ANNOUNCEMENT HAS been made that both the Weather Bureau airport station and the Department of Commerce teletype radio communication headquarters will remain at Love Field, in Dallas, and not moved to Fort Worth as was first planned. Assurance of their retention by Dallas was given to Sen. Connally and Rep. Sumners of Texas, chamber of commerce and city officials.

Seven men are employed at the weather bureau office and four in the teletype bureau. The services are maintained on a twenty-four hour basis and handle communications for the weather bureau and relay its reports by radio to planes and type forecasts to all ground stations on the teletype printer circuit. The forecasts are transmitted along the Federal airways to the next terminal point, and as far as Nashville, Brownsville, El Paso and Wichita.

Utica Assured of Airport Funds

H. R. GRABURN, director of the Utica Work Bureau, has received assurance of a grant of $10,000 from New York TERA officials for completion of the work at the local Municipal Airport.

Work on the airport, which will make it a first class landing field, was threatened by lack of funds. The new grant, which will probably be in the form of 100 per cent reimbursement for materials, equipment and labor, is expected to carry the work through to completion with little or no delay.

IDAHO TO HAVE 72 NEW AIRPORTS IN STATE

WITH THE completion of 32 projects now being constructed in Idaho by CWA workers, the state will have 72 landing fields, according to A. C. Blomgren, director of aeronautics. There are 40 landing fields in the state at present; five years ago, in 1929, there were only six. Many fields are also being widely improved.

Government Bureaus at Glendale

GRAND CENTRAL Air Terminal, Glendale, Calif., has recently been equipped with four United States government offices including a Custom House Branch, Immigration Bureau, Quarantine Station and Agriculture Inspection Service. All airlines now flying between the Los Angeles area and Mexican, Central or South American points, are using Grand Central and its multiple facilities.

Major C. C. Moseley, general manager, is pursuing a policy of "exclusive service" that many other airport executives are watching with interest. He is leasing space to only one branch of aviation at a time, thereby eliminating unfriendly competition.

An addition to the runway seems assured, since the City Council has almost committed itself to filling in the city dump at the southwest end of the airport so it may be added to the institution.

E. A. L. To Base at Shushan

EASTERN AIR Lines, Inc., has contracted to use Shushan Airport at New Orleans, following the successful culmination of negotiations between G. R. Cushing and H. A. Elliott of the operating company and A. L. Shushan.

El Dorado Port Nears Completion

WITH APPROXIMATELY $12,000 already spent in improvements, El Dorado, Ark., is about to complete one of the finest airports in the state. Located in the southern outskirts of the city, a short distance from the corporate limits, it will have two 2,600-ft. runways, several small hangars, a pumping station and other necessary facilities.

New Rental Plan at Columbus

A NEW plan for the leasing of space at Port Columbus has received tentative approval of the Columbus City Council. It calls for an increase in the annual rental paid by an airline company, $1,000 being paid for hangar space and an extra charge for the handling of passengers and mail, the sum to be determined by the volume of business. Previously only a fixed charge was paid by the airline for its lease.

Brandeweide Heads Airport Unit

LAMBERT-ST. LOUIS Airport Association, organized last year, started its second year with the reelection of old officers and a social meeting.

Officers are: president, G. J. Brandeweide; vice-president, W. Kratz and secretary-treasurer, A. W. League.

The airport association represents: Airlines Airport Ticket Office Ass'n., American Airlines, Brayton Airplane Sales Co., City of St. Louis, Curtiss-Wright Airplane Co., Independent Operators, Lambert Aircraft Corp., Robertson Airplane Service Co., St. Louis Flying Service, 35th Division Aviation Missouri National Guard, Transcontinental & Western Air, Inc., United States Naval Reserve Air Base, Verlin Concessions, Pacific Seaboard Airlines, Bowen Airlines and Supply Division, Inc., all located at the field.

New Airport Opened

GEORGETOWN, S. C., on the coast 60 miles north of Charleston, has just completed an airport on the edge of town at the city limits. This field has approximately 2,500 feet landing space available in any direction, is covered with Bermuda grass and is tile drained. There are no nearby obstructions.

A hangar is under construction and the field is marked with a 100-foot circle. Being at the edge of town, gas and oil and mechanical services are available. Georgetown has been used as a seaplane refueling base for a number of years and the completion of the airport makes available facilities for any type of aircraft.

Distributor Unit Formed

FAIRCHILD AIRPLANE Sales Corp., has inaugurated a new set-up to take care of the increasing demand for its planes, to give better service to its users and to tend to their dealers in the New York, New Jersey and New England territory.

The company, which has taken space in Hangar C, Roosevelt Field, is headed by Manola Weichers while active operation will be directed by Beckwith Havens and Richard H. Depew, Jr.

Cord Products Station Opens

EASTERN SALES and service headquarters for Stinson aircraft, Smith propellers and Lycoming engines have been established in Hangar 17, Roosevelt Field, Mineola, N. Y., by Barb-At Sales, Inc., a new corporation.

The company has taken over the Stinson sales contract of Atwell Sales Company and will establish a well-equipped shop for the service of Stinson aircraft as well as Smith controllable-pitch propellers and Lycoming engines, all products of subsidiary companies of the Cord Corporation.

Executives include George Atwell, Jr., and R. J. Barbin, with Jack Connelly in the sales department and Herman Cohen in the service shop.

Missouri Airport Dedicated

A TWO-DAY dedication of the airport at Koshkonong, Mo., was held at Brock Field with the show sponsored by the local American Legion Post. The feature of the dedication was a visit by the Missouri Chamber of Commerce Aerocade on its annual good will tour, which remained throughout the dedication ceremony and celebration.

The field is named in honor of Dr. John D. Brock, sportsman pilot of Kansas City, who is making a flight a day and who hopes to continue until at least five years have elapsed.

Aerial Photography Unit Formed

PACIFIC AERIAL Surveys, Inc., has been formed and incorporated at Seattle, Wash., with a capitalization of $5,000. It will engage commercially in aerial photography. Incorporators are Knute S. Nelson, Floyd H. Backeberg, and Clifford E. Hoof.

Stinson Reliant Purchased

JACK WHITNEY has just purchased, for his own use, a 1934 model Stinson Reliant. This ship has been fully equipped with all the latest instruments together with radio and special facilities for aerial photography, and will be used for charter work and photographic trips. Whitney is located in the Roweka Hangar, Roosevelt Field, Mineola, N. Y.

Wind Storm Causes $2500 Loss

DAMAGE in excess of $2500 was done to hangars, planes and gliders at the Bendix Municipal Airport, South Bend, Indiana, by a wind storm which carried away the front of the Stockert Flying Service hangar.

Although the maximum wind velocity did not exceed 58 miles, the one hangar of the four caught the full force of the wind on its closed door. They were forced in and loosened from the tracks and the doors and a portion of the roof fell on stored ships, damaging them.

MICHIGAN BARNSTORMERS FIND BUSINESS GOOD

AFTER SEVERAL years of lean going Michigan's barnstorming flyers apparently are finding business improving. During the past few weeks the State Board of Aeronautics has granted at least 25 permits to commercial pilots allowing them to carry passengers from temporary fields.

Nashville Port Site Recommended

PROPONENTS OF erecting an airport near the home of Andrew Jackson, ex-president, at Nashville, Tenn., have acceded to the wishes of the Historical Association of the Hermitage Association and local city officials have agreed to recommend a 340-acre site on the Murfreesboro Road, six miles from town.

Sky Harbor, the present field, is 26 miles away and a site closer to the center of the town is being sought.

Air Show Features Dedication

THE NEW Minor Stewart Airport on Alemeda Road, Houston, Tex., was dedicated recently when an air show, under the supervision of Hugh Thomasson, attracted thousands of spectators to the new project.

Included in the program was a number of speed races, stunting and precision contests.

Beautification Program Sought

TWA, American Airlines, Central Airways of Mexico and the Varney Speed Lines are endeavoring to have the City Council of Glendale, California, develop the territory surrounding the Grand Central Air Terminal into the equivalent of a park. Numerous citizens of Glendale are behind the proposal to beautify the surrounding streets with palms, flowers, and some are suggesting restrictions requiring only Spanish type architecture.

Pacific Airmotive Sales Increase

WITH UNFILLED orders on hand in excess of $100,000 and an 82 per cent gain in gross sales for the first six months of 1934, Pacific Airmotive Corporation, Ltd., Union Air Terminal, Burbank and Oakland Airport, Oakland, Calif., reported the busiest half-year in its history.

According to W. E. Thomas, president and treasurer, sales totaled $253,777 as against $139,758 for the corresponding period last year, a gain of $114,019.

This stimulation in business may be attributed to the heavy transport plane building program of such manufacturers as Douglas, Northrop and Lockheed which draw on Pacific Airmotive for many accessories required in the completed plane.

On July 24, sales touched $303,093.34, a figure that exceeded total sales for the entire year of 1933, which registered a volume of $282,365.09.

Net profit for the first six months after all reserves had been taken care of, including reserve for Federal taxes, was $6,692.52, as compared with a loss last year for this period of $5,952.55.

Dealer Sells Six New Ships

TEXAS FAIRCHILD Sales Corp., distributors for Fairchild aircraft with offices at the Houston Municipal Airport, has in the two months since it received its franchise, sold six new planes, including three cabin and three Gypsy-powered 22's.

According to R. E. McKaughan, the company also offers student instruction and 24-hour charter service.

Seaplane Company Organized

PEWAUKEE SEAPLANE Base, Inc., has announced the establishment of their new base in the village of Pewaukee, Wis., where the organization is offering student instruction, passenger flights and charter service. The concern also handles Aeronca seaplane sales.

French Island Port Gets Aid

THE LA CROSSE County Board has voted an appropriation not to exceed $5,000, to complete the county airport on French Island, Wis. Under the set-up the government, through the PWA, is providing $9,850 for materials and equipment, while the state relief administration has set up approximately $28,000 for labor.

More Planes Being Produced

ACCORDING TO reports just issued by the Bureau of Air Commerce, aircraft manufacturing in the United States is on the upgrade and definite advances in business have been made this year compared to 1933.

Seven hundred forty-eight airplanes were manufactured in the United States during the first half of this year. Three hundred seventy-four were for domestic civil use, 264 for military delivery and 110 for export. In the first six months of 1933 the number of airplanes produced was 673, of which 310 were for domestic civil use, 212 for military delivery and 151 for export.

The greatest monthly production was during June when 196 were manufactured as against 96 for January. Aircraft construction for domestic civil use numbered 24 in January while in June this figure had grown to 113.

The 374 airplanes built for domestic civil use during the first six months of this year included 273 monoplanes and 101 biplanes. Of the monoplanes, 122 were open cockpit and 151 were cabin types. The biplanes included 29 open cockpit and 72 cabin aircraft.

Aircraft production figures in this report are based on a record of Department of Commerce licenses, identification marks issued for unlicensed airplanes and reports as to military deliveries and export production for aircraft manufactured during the first half of 1934. There is a possibility, however, that there still may be a few aircraft which were manufactured during the period for which licenses or identification marks have not yet been sought.

Pure Oil Operates Three Planes

WITH JIMMY MATTERN continuing his tour of the country in a new Bellanca for the Pure Oil Co. as World's Fair ambassador, Major D. H. Young piloting a Waco cabin and the Fokker "Voice of the Sky" ready for its 32-state trip, the company is well represented in the air.

The Fokker is being used to advertise the company's products by means of messages from the air; Major Young is utilizing the Waco for making tests, research and development of aviation fuel.

WACOS TO BE MADE BY CANADIAN COMPANY

MANUFACTURING RIGHTS for the production of its aircraft in Canada have been granted by the Waco Airplane Co. to W. J. Sanderson, who has established a factory at Fort Erie, Ontario. The first Canadian-assembled cabin job was purchased by the Imperial Tobacco Company, Ltd.

State Officials Meet at Cheyenne

THE NATIONAL Association of State Aviation Officials is to hold its fourth annual meeting at the Plains Hotel, Cheyenne, Wyo., September 27-29 inclusive. The program has been prepared to provide for an exchange of ideas between representatives of the federal and state governments and those of the industry and general public.

The morning session of the first day will be taken up with preliminary details, but during the afternoon and evening, talks and discussions will predominate the action. The federal airport development program will be discussed while George B. Logan and Richard S. Boutelle, respectively, will talk on aeronautical law and the coordination of state and federal control of aeronautics. On the following days talks will be delivered by Elwood B. Cole, Floyd E. Evans, Rex Martin, R. W. Schroeder, D. R. Brimhall, James H. Doolittle and E. Smythe Gambrell.

A banquet will bring the meeting to a close on the evening of the 29th.

Ryan S-T Gets A.T.C.

A DEPARTMENT of Commerce approved type certificate has been granted the Ryan Aeronautical Co., San Diego, Calif., on its Ryan S-T monoplane powered with either the 95 or the 125 h.p., Menasco engine. This new plane, described fully in the July issue of AERO DIGEST, is an all-metal fuselage ship credited with a cruising speed of 120 m.p.h., and a top speed of 142 m.p.h., with the 95 h.p., installation and a cruising speed of 132 m.p.h., or 152 m.p.h., with full throttle on the 125 h.p., engine.

Immediate production schedules on the new ship are being rushed.

Following approval of the plane, the sales department sold two ships and announced an influx of daily inquiries that would undoubtedly absorb the entire output of the plant for several months.

Warren Worcester, San Diego, purchased one plane while Peter Dana, transport pilot of Holderness, N. H., purchased the other.

Five New Northrops Ordered

FOLLOWING COMPLETION of flight tests of the new Executive model at the factory of the Northrop Aircraft Corp., in Inglewood, Calif., it was revealed that orders for five of these planes have been received.

In tests the Executive attained a top speed of 220 m.p.h., at 5000 feet, while at 75 per cent of the available horsepower, the plane cruised at 200 m.p.h. The interior of the plane is equipped with four chairs and a couch along the right side and is finished in red and tan leather. Featured are complete soundproofing, double ventilation and dual controls. The cockpit is separated from the cabin.

Additional equipment includes hydraulic brakes, electric flap control and retractable landing lights. A controllable-pitch propeller is attached to either a 750 horsepower Wright Cyclone or Pratt & Whitney engine.

715 h.p. Wright Cyclone-powered Executive model recently introduced by the Northrop Company

June Exports Total $894,655

EXPORTS OF aeronautical equipment from the United States in June, 1934, were slightly higher than the preceding month, $894,655 being realized from the sale of aircraft, engines, parts and accessories in foreign countries.

Planes (23) and engines (44) valued at $466,785 and $229,739 respectively, account for the bulk of the value of the shipments. Sales of parachutes amounted to $4,319 and parts and accessories brought $193,812. In May, 33 airplanes and 30 engines were exported.

German importers bought more from us than any other country during June, spending $271,816; Russia spent the next largest amount, $109,806 while China and Peru made imports amounting to $108,857 and $89,188 respectively. Germany also spent the largest amount for aircraft, $187,110; Russia for engines, $81,280; Portugal for parachutes, $4,235 and Colombia for parts and accessories (except tires) $53,951.

American aircraft were purchased in the other following countries: Mexico (5), Guatemala (4), Peru (3), China (2) and one each in Argentina, France and Sweden.

New Stinsons Delivered

THREE NEW Stinson planes have been delivered to Long & Harmon in Dallas to be used on the Amarillo-Gulf route of air mail flying which this concern was successful in bidding for. Major William F. Long went to Michigan to accept the ships. A fleet of five planes is used on the route.

Kindelberger Heads General Aviation

JAMES H. KINDELBERGER has been elected president of the General Aviation Manufacturing Corp., Baltimore, Md., subsidiary of North American Aviation, Inc.

Kindelberger, who is a graduate of Carnegie Institute of Technology, spent several years with the Army Air Service, and since that time has been associated, in an engineering capacity, with the Glenn L. Martin Co., and for the past several years with Douglas Aircraft Co.

Manufacturer Incorporated

AVA AIRCRAFT Corp., of Houston, Texas, has been incorporated to manufacture aircraft. Incorporators are Dewey Bonebrake, W. T. Sinclair and George R. Morgan.

Digest of Recent Events

Hirth Sets New Glider Record

A NEW record for sustained glider flight was claimed by Wolf Hirth who sailed from Wasserkuppe to a point near Goerlitz, a distance of 223.5 miles. If this mark is homologated, it will surpass the recently accepted record of 155 miles made by Richard duPont at the Elmira meet. Hirth was flying his Moazatfotl glider and took more than six hours for the trip. JULY 27.

Stratosphere Ship Almost Reaches Record

THE *EXPLORER,* the stratosphere balloon flown by Capt. Albert W. Stevens and Major William E. Kepner in their attempt to penetrate the stratosphere for scientific research, reached an altitude of 60,613 feet before it was forced down by a tear in the bag. The official stratosphere flight record is 61,236 feet made by Lieut. Comdr. T. G. W. Settle and Major Chester Fordney. Despite the great height from which the gondola fell and despite the fact that the gondola was totally destroyed, many of the records made by the instruments and many of the films exposed in the stratosphere, were salvaged. JULY 31.

Woman Ascends to New Record Height

MRS. CECIL W. Kenyon, Boston's outstanding aviatrix landed at the East Boston Municipal Airport with an unofficial New England woman's altitude record of 17,500 feet. Mrs. Kenyon flew a Waco plane. AUG. 1.

French-Argentine Mail Flown to New Record

HALVING THE time formerly required to fly the mail between Paris and Buenos Aires, a French Aeropostale plane arrived in Buenos Aires 3½ days after the mails had been put aboard at Paris. Argentine mail which left Buenos Aires Saturday morning arrived in Paris Wednesday afternoon, another record for the flight which was made in the Southern Cross and Rainbow planes. Formerly, fast dispatch boats of the French Navy made the sea trip, but with these new planes, the crossing is made entirely by air. AUG. 1.

Glider Train Makes Successful Trip

THE FIRST aerial mail glider train completed its flight from New York when the last of three gliders, towed by plane, landed in Potomac Park, Washington, D. C. The first glider landed at Philadelphia, where the train was delayed because of weather. The second lap was to Baltimore where the second glider cut loose. The pilot of the Waco was Elwood Kein and the glider pilots were Jack O'Meara, Stanley Smith and R. A. Franklin. Special loads of mail were carried. AUG. 3.

Claims Speed Mark For Women Fliers

CLAIMING TO have traveled faster than any other woman in an airplane, Helene Boucher, French aviatrix, did 276.063 miles an hour over a 1,000-kilometer course at Istres, France. The previous record for the distance was held by May Haizlip, who established it on Sept. 5, 1932. Mlle. Boucher also holds the world's altitude record for women at 19,357 feet. AUG. 8.

First Canada-England Flight Is Completed

ALTHOUGH FAILING to reach Baghdad and break the world's long distance flight record, James Ayling and Leonard Reid did make the first Canada-England hop when they left Wasaga Beach, Ontario, and after flying across the Atlantic landed at Heston airfield in Middlesex. They had covered 3,500 miles in 30 hours 51 minutes, considerably short of the 5,657.6-mile record held by Rossi and Codos. Ayling and Reid flew a twin-engined Moth, the same plane built for James and Amy Mollinson to fly across the Atlantic but it was renamed the Trail of the Caribou instead of the Seafarer. AUG. 9.

Coming Events

Polish Tour

International Touring Challenge of the Polish Aero Club. AUG. 28-SEPT. 16.

National Air Races

1934 National Air Races, sponsored by National Air Races of Cleveland, Inc., and under the management of Clifford and Phillip Henderson, 103 Terminal Tower Bldg., Cleveland. To be held at Cleveland Municipal Airport. AUG. 31-SEPT. 3.

State Air Meet

Annual All State Air Meet of West Virginia. Jackson's Mill, Weston, W. Va. SEPT. 1-3.

European Circuit

Circuit of Europe flight and speed contest. Challenge de Tourisme International, Warsaw, Poland. SEPT. 7-16.

Regional Meet

Second Annual Buffalo Air Races. Buffalo Municipal Airport, Buffalo, New York. Speed races and exhibition flying. SEPT. 8-9.

Air Derby

Southern Wisconsin Air Derby. Sponsored by Myron C. West Post, American Legion. Beloit, Wis. SEPT. 8-9.

Air Tour

Sixth Indiana Air Tour. Herbert O. Fisher, director of Aeronautics, Indianapolis Chamber of Commerce, Indianapolis, Ind. SEPT. 10-16.

Oklahoma Tour

Second 1934 Oklahoma Air Tour. Sponsored by Oklahoma City Aviation Club. SEPT. 15-16.

Gliding Contest

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park, Va. SEPT. 15-30.

Bennett Balloon Races

Gordon Bennett Balloon Race. Auspices of Polish Aero Club, Warsaw, Poland. SEPT. 20.

Women Engineers Meet

Twelfth Annual Conference of Women Engineers and flying garden party. Norfolk and Norwich Aero Club, Norwich, England. SEPT. 21-22.

State Officials' Meeting

Fourth Annual Meeting, National Association of State Aviation Officials, Cheyenne, Wyo. SEPT. 27-29.

MacRobertson Race

London-Melbourne International Air Race. Speed and handicap event. Under regulations of F.A.I. and competition rules of Royal Aero Club. Sponsored by Sir MacPherson Robertson. OCT. 20.

Air Show

Fourteenth International Aero Salon, Paris, France. NOV. 16-DEC. 2.

Aero Inspectors Transferred

M. F. CLARK, inspector for the Aeronautics Branch, Department of Commerce, who has been stationed at Little Rock, Ark., since September, has gone to Houston, Tex., where he has been transferred. Asbury Meadows of Hot Springs, Ark., a former commander of the 154th observation squadron, Arkansas National Guard, who has been stationed at Houston for the last eight months, has been assigned to Little Rock to succeed Mr. Clark. Mr. Meadows served in the World War as a first lieutenant in the Army Air Corps, he helped to organize the Observation Squadron in 1925, was in charge during its activities during the flood of 1927, and resigned in 1928. Later he served as an airline pilot, before he became connected with the Department of Commerce.

Standard Oil Buys Two Monocoupes

AIRCRAFT UTILITIES Co., located at Newark Airport, N. J., has just sold two 98 de luxe Monocoupes to the Standard Oil Company of New Jersey.

These planes will be painted in the company's colors with the fuselage in red and the wings in silver. The familiar eagle will also appear on the ships.

Charlie Sherman is general manager of the Aircraft Utilities Company.

Restrict Aircraft Owned by Aliens

FOREIGN VISITORS to the United States who are owners of airplanes will be privileged to obtain limited aircraft registration from the Bureau of Air Commerce, Department of Commerce, according to Eugene L. Vidal, Director of Air Commerce, who said that the special licenses issued in such cases would not be valid for interstate or foreign commercial operations.

Limited registration for aircraft owned by aliens was authorized to permit visitors from abroad to purchase aircraft in the United States and tour the country or otherwise engage in private flying. It does not affect foreign aircraft visiting in this country, as these craft operate under their foreign registry after special permission has been obtained for the owners by their governments. However, a foreign aircraft can be brought to this country and licensed here, provided it meets the airworthiness requirements of the United States Department of Commerce.

Aldrin in Europe

MAJOR E. E. ALDRIN, head of the aviation department of the Standard Oil Company of New Jersey is now in Europe where he is working on a number of projects.

He is coordinating the overseas interests of the Stanavo Specification Board and the Standard Oil Company of New Jersey as well as representing the Aeronautical Chamber of Commerce at the International Air Traffic Association conference at the Hague.

In addition to visiting various airports and witnessing some aerial events, Major Aldrin is supervising arrangements for supplying fuels and lubricants for entrants in the MacRobertson Air Races.

Three Fairchilds Sold for Export

WHILE THE Fairchild factory at Hagerstown, Md., is busily engaged in producing aircraft for domestic use, a number of 22's and 24's have been sold for export, the deals for three being completed in the past month.

Dr. Vance Murray, medical director for the Alaskan Indian Territory who has his office in Juneau, Alaska, has purchased a 24 cabin plane for covering the vast territory under his supervision. Special equipment has been installed in the plane, including cabin heaters and devices to facilitate cold weather starting. Since most of Dr. Murray's flying will be done over snow, skiis have been added to the plane's equipment.

Tri-American Aviation, Inc., sold a 3-place cabin job to Carlos E. Martin of Rosario, Argentina, while Donald C. Kneedler of Manila, P. I., took delivery on another cabin job, the third Fairchild he has purchased in the past year.

United Reports Deficit

UNITED AIRCRAFT & Transport Corporation reports consolidated net loss of $1,267,536.06 for the quarter ended June 30, 1934, or a total consolidated net loss of $1,978,925.81 for the six months ended that date.

During the six months' period, the net loss for the transport companies amounted to approximately $1,508,000, due principally to the loss of air mail revenue for the period dating from the annulment of the air mail contracts in February, to the commencement of operations in May under temporary contracts, revenue under which is lower than formerly. These contracts were renewed August 8 for an additional nine months.

For the six months, the western manufacturing companies show a net loss of approximately $631,000, due principally to the resulting loss of cost over selling price in connection with the deliveries made during the period by the Boeing Airplane Company on an Army aircraft contract.

The eastern manufacturing group shows a net profit of approximately $160,000 for the same period. The results of this group were adversely affected by the strike from April 10 to May 21 at the plant of The Pratt & Whitney Aircraft Company, in Hartford, Conn., which compelled the shutdown of operations during that period. The net profit or loss for the period of the three groups as stated includes a deduction covering the net operating expenses of the parent company, which expenses were higher during the period than usual due to extraordinary expenses occasioned under the Plan of Reorganization.

Unfilled orders on hand on June 30, 1934, amount to approximately $1,431,000 for the airplane companies in the western manufacturing group, $1,327,000 for the airplane companies in the eastern manufacturing and $4,919,851 for the engine and propeller companies.

Boeing 247-D's in Tests

THE FIRST of the Boeing Airplane Company's new Model 247-D transport planes, equipped with geared Pratt & Whitney Wasp engines and three-bladed Hamilton Standard controllable-pitch propellers began taking to the air late last month. Twelve of the high-speed planes have been completed for delivery to United Air Lines and for sale to other air transport operators.

The first of the Model 247-D's to receive the new engines is to go to Germany as the third Boeing transport to be delivered to Deutsche Luft Hansa, while others are being delivered to United Air Lines as fast as they can be tested and flown away.

Complete performance figures on the Model 247-D have not yet been announced but it has been definitely determined that the plane will be considerably faster than its predecessor, the Model 247. It also will embody a number of improvements in the nature of soundproofing, heating and ventilating facilities.

New Requirements Effective Oct. 1

A REVISED edition of the Department of Commerce Airworthiness Requirements for Aircraft will become effective October 1, 1934. The new regulations were to have been promulgated as of August 1, but a delay in printing has made it necessary to postpone the effective date.

Aeronautics Bulletin No. 7-A, in which are set forth the actual airworthiness requirements, hereafter will have as a companion publication, Aeronautics Bulletin No. 26, *Design Information for Aircraft*. Every effort will be made to have copies of both bulletins available for distribution to the industry sufficiently in advance of the effective date so that the manufacturers can become familiar with the revised requirements before they are placed in effect.

Flyabout Distributor Appointed

HARRY A. HAMMILL, Hangar 9, Love Field, Dallas, Tex., has signed a distributor's contract for the State of Texas, Southern Oklahoma and part of Mexico with Porterfield Aircraft Corp., Kansas City, Mo.

The Flyabout has a top speed of 115 miles per hour and a cruising speed of 100 miles per hour on four gallons of gasoline or 25 miles to a gallon.

Detroit Manufacturers Optimistic

AIRCRAFT ACTIVITY in the Detroit area has been increasing considerably and manufacturers in that territory are reporting greater progress and more business than at any time in some years.

Lawson Faunce, vice-president of Warner Aircraft Engine Corp., said his business had increased nearly 100 per cent over last year and that indications point to a continuation of this progress. Ray Long, sales manager of the aviation division of Continental Motors, was also optimistic about conditions and reported renewed activity in development work and a 50 per cent increase in business.

It was also reported that the Detroit Aircraft Corp., has been reorganized and expects to develop a new plane in the near future.

Company Incorporated

SHIFFLETT AIRWAYS, Inc., has been granted a charter by the Secretary of State of Oklahoma to operate in Mangum. Incorporators are Ray Shifflitt, Eugene Swank and Alvin Kindel. Authorized capital stock is $25,000.

Three-Place Planes Most Numerous

ACCORDING TO Department of Commerce license and identification records, three-seater airplanes are more numerous among civil aircraft in the United States than craft of any other capacity. Two-seater types occupy second place in this respect.

On June 1 there were 3,873 three-place, 2,445 two-place, 816 four-place, 700 one-place and 44 airplanes capable of carrying 16 or more persons, including crew.

These facts appear in a study made by the Aeronautics Branch of the age, weight, number of engines, horsepower and seating capacity of aircraft which its records show are bearing licenses or identification numbers as of June 1, 1934.

Single-engined planes outnumbered multi-engined aircraft 8,451 to 309. However, multi-engined designs lead in proportion licensed, for nearly all hold licenses. About one-fourth of the single-engined airplanes have been assigned identification numbers only.

Of the aircraft in service June 1, the majority were manufactured in 1929, 1930 and 1931. Aircraft manufactured in 1929, totaling 2,593, comprise the largest group. About 200 of the planes were found to have been manufactured in 1926 or prior thereto, and more than 4,000 were found to be powered with engines of 90 horsepower and under.

Kendall Gets New Sales Manager

T. O. GRISELL, formerly executive secretary of the Pennsylvania Grade Crude Oil Association, has been appointed to the position of sales manager of the Kendall Refining Co., filling the post held by I. H. Shearer, who has resigned. Mr. Grisell will assume his new duties Oct. 1.

Four Lockheed Planes Sold

ADDITIONAL ORDERS for aircraft have been reported by Carl B. Squier, vice-president, Lockheed Aircraft Corp., Burbank, Calif.

Within thirty days of the receipt of their first Electra, Northwest Airlines exercised an option for two similar ships and placed an order for two more, giving a total of five. Continental Oil Company, Ponca City, Okla., has also purchased an Electra as has Santa Maria Air Lines of Santa Maria, Calif. Both of these later ships will be used for executive transportation.

A standard 7-place Vega powered by a Pratt & Whitney Wasp SC-1 has been ordered by W. P. Fuller, Sr., president of W. P. Fuller & Co., San Francisco. Equipment in the Vega will include a Westport radio receiver and intercommunication set for conversation between passengers and pilot. Fred Hammer is pilot for the Fuller company.

EIGHT RECORDS BROKEN BY BRAZILIAN CLIPPER

AMERICA NOW holds eight transport seaplane flight records as a result of the final test flight of the Pan American Sikorsky S-42 "Brazilian Clipper." The plane flew 1,242.8 miles at an average speed of 157.5 m.p.h., with a full load at cruising speed in making the new records. The Clipper also owns two other records, both for carrying payloads to altitudes. The plane only used 69 per cent of the total horsepower available in the P. & W. Hornet engines which were using Stanavo Octane 87 fuel.

Aviation Corp. Loses $1,144,634

CONSOLIDATED NET loss of the Aviation Corporation and its subsidiary companies for the six-month period of the current fiscal year ended June 30, 1934 was $1,144,634. This compares with a profit of $321,057 for the same period of 1933.

Mail revenue for the six months' period of 1934 was $719,709, as compared with $2,666,515 in the 1933 period.

Passenger revenue for the six months' period of 1934 was $748,336 against $805,022 in the 1933 period.

Total transportation revenue in the first six months of 1934 was $1,530,137 as compared with $3,523,261 for last year.

Revenue miles flown were 3,970,916 against 5,838,367. The number of revenue passengers carried was 42,909 for the period just past as compared with 48,506 for the period.

Department Gets Chute Authority

SPECIFIC authority to pass on the airworthiness of parachutes has been extended to the Department of Commerce, as the result of an amendment to the Air Commerce Act of 1926.

Regulations respecting the manufacture, packing and repairing of parachutes previously have been promulgated on the basis of general provisions of the Air Commerce Act, directing the Secretary of Commerce to regulate air commerce, and the recent amendment makes these instructions specific with respect to parachutes. As amended, the Air Commerce Act directs the Secretary to "provide for the rating of aircraft of the United States and parachutes used in connection with such aircraft, as to their airworthiness," and in addition adds to the definition of the word airman by specifying that the person who inspects, overhauls or repairs parachutes is in this category, together with pilots and airplane and engine mechanics.

Evans Joins British Firm

STANLEY H. EVANS, formerly Dean of the Engineering School in the Curtiss - Wright Technical Institute, Grand Central Air Terminal, Glendale, Calif., has returned to England to assume charge of the airplane division in a newly organized British manufacturing plant. Evans was in charge of the Curtiss-Wright Institution for more than three years and is being succeeded by C. E. Stryker, authority on metal construction.

Applicants to Pay Hearing Costs

AN APPLICANT for public hearing on denial, revocation or suspension of a license or other certificate issued by the Bureau of Air Commerce of the Department of Commerce will be charged for part of the expense of such hearing if the evidence is insufficient to bring about a reversal of the Department's original decision in the case, according to Eugene L. Vidal, Director of Air Commerce.

The portion of the costs to be borne by the applicant will be determined by the Secretary of Commerce, and the applicant may be required to furnish bond covering all such costs before the matter is heard, if the Secretary so directs. Heretofore the Federal Government has met the expenses of such hearings.

. TRADE LITERATURE .

United Air Logs

• ELABORATE AND detailed air logs have been prepared and published by United Air Lines for passengers traveling over various divisions of the company's nation-wide network. Four different logs, covering the New York-Chicago, Chicago-Pacific Coast, Seattle-San Diego and Portland-Salt Lake City airways, have been issued and placed on company planes. In book form, all are of twelve pages with the exception of the Portland-Salt Lake City map, which is covered in eight pages.

Printed in color, maps similar in detail to air corps strip maps show sections of the divisions, accurately depicting the course of flight and revealing topographical features, highways, railroads, rivers and other distinguishing marks along the routes being flown.

An eight-page booklet presenting interesting features of airplane construction, air transport operation and air passenger traffic, has been produced by the company for distribution to prospective air travelers. The booklet is designed to provide information on aviation in an interesting manner, so that persons unfamiliar with air transport service will be attracted to it. National distribution of the book is now being made by traffic representatives of United Air Lines.

Aerial Cameras and Accessories

• A NEW catalog of the Fairchild line of aerial cameras and accessories has just been published by the Fairchild Aerial Camera Corp., Woodside, N. Y. It contains more than 150 pages of detailed information on aerial cameras and their application to all commercial and military uses including general utility, vertical mapping, oblique photography, military intelligence and special purposes.

There are more than 200 illustrations including reproductions of many unusual and interesting photographs taken with Fairchild cameras.

Copies are available upon request to officials of aircraft companies and commercial aerial photographic organizations as well as to ranking officers of military organizations. To all others there is a charge of $4.00 per copy.

Welders and Welds

• THE PURPOSE of "The Testing and Qualification of Welders," a 24-page illustrated booklet, is to outline simple tests for measuring the ability of welders, the first of the six essential steps in every procedure control for oxy-acetylene welding.

It is pointed out that welding technique differs somewhat with the materials to be welded and with the type of joint used, so that it cannot be assumed that a man who can weld excellent joints in aircraft tubing can also do as well on 20-in. steel pipe. Separate sections of the book discuss in detail the fracture test, the bend test, the tensile test, and the observation test. To round out the booklet, a summary of existing and pending qualification tests for welding steel plate and pipe are given. This includes: the A. S. M. E. Unifired Pressure Vessel Code for both Class 2 and Class 3 welded constructions, the A. S. A. Pressure Piping Code (unofficial) and the specifications and standards covering welding of steel and wrought iron pipe of the Heating and Piping Contractors National Association.

Linde Air Products Co., New York, N. Y., are the publishers.

Fabricating Stainless Steel

• A COMPREHENSIVE guide to the fabrication of stainless clad steel has just been issued by the Ingersoll Steel and Disc Co., Chicago (division of the Borg-Warner Corp.). This 16-page booklet, entitled "Manual of Welding and Fabricating Procedures for IngAclad Stainless Clad Steel," takes up the various methods of welding, soldering, lock seaming, riveting, deep drawing, pickling, heat treating, etc., encountered in fabricating products of stainless clad steel.

A feature is an illustrated section showing actual installations and applications of IngAclad in a wide range of industries. Other sections of this booklet are devoted to a description of the method of producing IngAclad by the original welded-in-the-ingot process, the physical properties of the clad material, etc. The Manual contains many interesting diagrams.

Sundry Cabinets

• A FOUR-page folder describing a most complete line of cabinets and service shop accessories has been issued by W. C. Heller & Co., Montpelier, Ohio. Beside listing twenty different advantages of Heller cabinets, the folder contains illustrations, dimensions, construction and prices of various cabinets, kits, cabinet parts, tool racks and display cases.

The need for a cabinet containing small drawers to accommodate parts such as carburetors and machine units which must be kept free from dirt and dust, has been given much thought by the Heller company as evidenced by their products. Prepared primarily for airports, machine shops, manufacturing institutions and individuals who have small parts and supplies to accommodate, this folder indicates how a systematic, protective and dustproof system could be arranged.

FOREIGN NEWS IN BRIEF

Australasia

TWO FOUR-ENGINED 12-passenger airliners have been ordered by Tasmanian Aerial Services for its Launceston-Melbourne service. The first of the ships is expected to be delivered some time this month when it will be used to assist in transporting the increasing traffic anticipated during the Melbourne Centenary Celebration.

A NEW service between Sydney, Bathurst and Orange may be opened by Kingsford-Smith Airways, Ltd., following a request to the Dominion officials for a certificate to operate and upon completion of arrangements being made for the inspection and licensing of the airports along the route. The *Southern Cross*, which has been arranged to carry 12 passengers, may be used.

AS SOON as the supply of air mail stamps in India is consumed, no more will be issued. It is announced that it is impossible to keep a separate account of air fees on the basis of sale proceeds of air mail stamps.

France

SUBSIDIES FOR pilot licenses are again being granted this year, with approximately $100 going to those who secure a pilot's license. The only restriction made is that the pilot be a French citizen, between the ages of 18 and 30. Individuals holding scholarships and those who have received instruction at public expense are excluded.

CELEBRATION OF the 25th anniversary of the crossing of the English Channel by Louis Bleriot was featured by an aerial demonstration at Buc airport near Versailles. French and English fighter squadrons participated in the program while General Denain and Lord Londonderry, each in charge of aviation of France and Great Britain, respectively, attended. Bleriot flew the Channel on June 25, 1909. Bleriot himself contributed a message to the London *Times* which ran in a special section dealing with the advancement of aviation in the 25 years since the first channel crossing was accomplished.

Germany

EDGAR GOTTHOLD, a pilot of Breslau, recently completed a flight from Germany to Africa and return in a Junkers *Junior* covering about 15,500 miles and flying over 15 different countries. The engine was a 5-cylinder 80 h.p. Siddeley Genet, one of a series of engines made by Armstrong Siddeley Motors, Ltd.

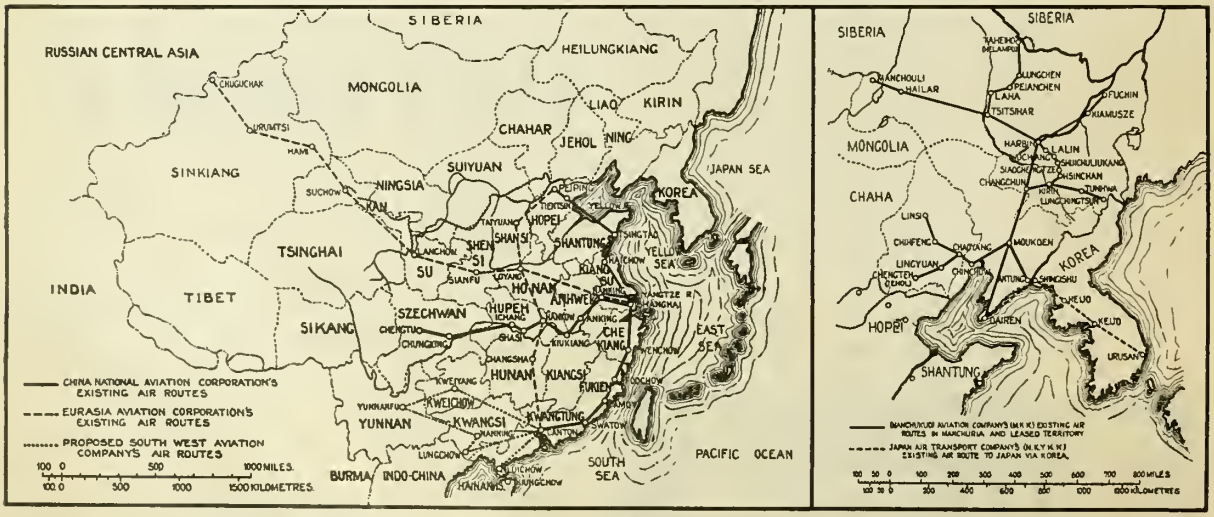
TRAFFIC ON the European air routes continues to increase steadily, and recently during the course of a single day more than 250 persons flew between London and Paris in Imperial Airways' airliners. Recent changes in schedules have reduced the flying time between London and various points in Europe and Eurasia. Rome is only 9 hours 30 minutes from London; Moscow 17 hours 5 minutes and Istanbul, 17 hours 55 minutes away.

Great Britain

A. V. ROE & CO., Ltd., of Manchester have been busy producing a number of autogiros, recently beginning production of twenty, of which ten were for the British Government. Further orders have been received from foreign governments, flying clubs and private owners and it is expected that production will be considerably speeded-up in order to meet the demands for the craft. In addition, the company is engaged in constructing a number of its Avro 642, sixteen-passenger transports, one of which has been ordered for the new service connecting Glasgow, Belfast, Liverpool and London.

SUCCESSFUL TESTS of a nine-cylinder, radial, air-cooled Diesel engine were recently completed in Great Britain when the 350-h.p. *Phoenix* was mounted in a *Wapiti* plane and flown to 28,000 feet with a pilot and ballast equal to another passenger. The engine was said to have lost power with increase in altitude at about one-half the rate noted in a gasoline engine of equal power under similar circumstances. Maximum power of the Phoenix at 16,000 feet was 400, and at normal r.p.m. of 1900, the engine delivered 350 h.p. The engine's dry weight is 990 pounds; its diameter is 53 inches and its compression ratio 14:1. The engine is reported to use 30 to 40 per cent less fuel, by weight, than a gasoline engine of equal power.

ANOTHER AVRO Cadet and an Autogiro have been ordered by Airwork School of Flying, Heston. Pending delivery of these planes, a second Cadet has been placed in service while a third has been ordered for the school's Newtownards base. (*Cont'd on following page*)



Existing routes of air transportation companies flying over China (left) and Manchukuo (right) *Shell Aviation News*

(*Continued from preceding page*)

THE FIRST aerial cruise of the principal cities of Europe in which a regular airliner was used left Croydon recently with a party of 24 tourists accompanied by uniformed couriers and interpreters in exactly the same manner as with surface travel cruises. The plane was chartered by the Polytechnic Touring Association and during its fortnight cruise covered approximately 3,000 miles visiting Amsterdam, Berlin, Vienna, Budapest, Venice, Rome and Marseilles before returning to London via Paris.

A SUBSTANTIAL order has been placed with the Blackburn Aeroplane and Motor Company, Ltd., for torpedo spotter reconnaissance aircraft for the Fleet Air Arm. The new plane combines the duties of a torpedo carrier with those of spotter reconnaissance work and has a boat-built, buoyant fuselage with watertight compartments, rivetted and sealed. A Siddeley *Tiger* of 700 h.p. is used in the plane which is available for shipplane or seaplane service. It has folding wings, monocoque construction and tanks built into the fuselage, the latter being a deviation from former English practice of building tanks slung between the longerons.

CAPT. O. P. JONES, veteran pilot of Imperial Airways has chalked up his 10,000th hour of flight during which he has flown more than 1,000,000 miles, made 4,500 crossings of the Channel and carried 65,000 passengers. Among other veteran pilots in the company's employ are Capt. H. J. Horsey with 9,261 hours; Capt. W. Rogers, 9,241 hours; Capt. A. B. H. Youell, 8,394 hours; and Capt. F. Dismore, 8,105 hours.

IMPERIAL AIRWAYS and four railway groups have formed Railway Air Services, Ltd., to operate a system of routes inside the British Isles. Aircraft have already been purchased and service is expected to get under way just as soon as equipment becomes available. Three routes will be flown this summer; between London and the Isle of Wight; between London and Glasgow via Belfast and between Plymouth, Cardiff and Bristol, with a possible extension to Liverpool. The entire system entails some 4500 miles of airways.

Italy

AN AIR meet at the Taliedo Airport, Rome, attracted a considerable number of tourists who arrived by air from various points on the Continent. One of the featured events was a flight around Lombardia which was won by Dr. Allessandro Guasti who flew a Caproni 100. Among other events was an acrobatic competition by the Pilots Archgelis, Antonini and Wengi, all of whom flew Caproni 113's and an exhibition flight of fighters of the Royal Italian Air Force.

The Potez 56, a commercial adaptation of a combat type, with Potez engines

SOCIETE AEREA Mediterranea, Rome, has taken over the services formerly operated by S.A.N.A. and will combine the routes. S.A.M. will now operate between Rome and Genoa, Marseilles and Palermo, Naples and Tripoli and in the Adriatic Sea.

THE FLIGHT made by Tivegna and Colombardi to a height of 6,272 meters (20,578 feet) with a cargo of 5,000 kg., has been homologated by the Federation Aeronautique Internationale as a new record. The plane used was a Savoia Marchetti S-72.

A NEW Fiat A-70 engine recently completed its official Air Ministry tests, running for 5 hours at 2,300 r.p.m. during which it rated 200 h.p.; 2 hours at 2,100 r.p.m. rating 180 h.p., and 50 hours at 2,100 r.p.m.

KEEPING PACE with recent trends aimed at building larger and more powerful aerial forces, Italy has appropriated about $100,000,000 for "extraordinary" expenses connected with its aerial defense. Officials of the government have been following with interest the reports of increased aviation programs in other countries and this appropriation is said to have been made to maintain Italy's position among the foremost in aircraft strength.

Mexico

PASSENGERS FLYING between Misantla and Jalapa (Vera Cruz) are paying fare according to their weight. A temporary arrangement conceived by Compania de Communicaciones Aereos Orizaba-Teziutlan, S. A., calls for a charge of about $4.10 for travelers whose weight does not exceed 165 pounds and 3½ cents a pound for each additional pound. Passengers are allowed 33 pounds of baggage for each full fare.

EIGHT NEW airports have been placed in service in the state of Vera Cruz. They are located at Jalapa, Orizaba, Huatusco, Misantla, Alto Lucero, Naolino, Paputta and Plan de Las Hayas.

Sweden

MORE THAN 70 aircraft companies exhibited in the International Show of Sport and Touring Aviation at the Grand Palais des Expositions Geneva, under the patronage of the President of the Swiss Confederation.

Most of the manufacturers of Great Britain, France, Germany and Italy were represented at the show, whose honorary committee included the chairmen of all countries who are members of the Federation Aeronautique Internationale.

AN INCREASE in dividends, from 4 per cent to 5 per cent has been announced by the Swedish Air Transportation Co., which reported a profit of $21,846 for 1933 compared with a net profit of $9,153 for 1932.

USE OF new and faster equipment has speeded up air schedules in Sweden and has allowed more frequent arrivals and departures than ever before. Summer schedules in and out of Kastrup Airport in Copenhagen are now at 32 arrivals and departures each day, with plans going forward for increased schedules. Among the planes being used are Junkers Ju-52's, a Wasp-powered Northrop and Fokker F-12's.

South America

SIX NEW airports of entry were recently designated in Colombia in accordance with a new law by which civil aviation is regulated. They are Barranquilla, Cartagena, Santa Marta, Tumaco and Turbo in addition to Cucuta where the airport is now undergoing completion preparatory to its official opening.

NEW PILOT licensing regulations in Argentina are now in effect. The licenses will be issued by the Direccion General de Aeronautica Civil and will be listed in A, B, and C groups. An "A" pilot is one who operates aircraft for sport or pleasure only; a "B" pilot is a commercial pilot authorized to fly with or without passengers and to serve on airlines while a "C" pilot is one authorized to engage in any aeronautical activity.

THE IDEAL DEALER

(*Continued from page* 15)

the merchandising essentials are included, he will find no permanent or profitable place in the distribution system of a fast growing industry. In outlining the elements of this ideal dealer set-up, it is best to group the various factors under separate headings: (1)—Hangar space and accessories. (2)—Demonstrators. (3)—Merchandising methods.

To overcome the merchandising disadvantages of the average dealer layout, it is of utmost importance to consider the comfort and convenience of the prospect. Naturally few dealers can afford the facilities of a complete hangar devoted exclusively to the display of various models and ships available for immediate delivery. Yet any dealer can make arrangements for rental of a definitely assigned corner in the hangar which will house his ship and the sales accessories so essential in doing a psychologically sound merchandising job. This corner should be so located that the plane can be quickly available for demonstration. An inexpensive rail fencing it off from other planes is most desirable. Several chairs or a wicker divan will permit comfortable discussion and a desk or table can contain literature, photographs, aircraft publications, order blanks, etc. The wall can be profitably relieved of its ugliness and bareness by enlarged flight photographs, pictures of other models, charts giving graphic performance figures, economy comparisons, various color combinations, photos of internal construction, etc. Such visual impressions will help greatly in punching home the important advantages of the dealer's particular product as compared with others. Testimonial letters featuring customer satisfaction also will serve their purpose. None of these ideas is new, but the very fact that they are universally used with other products simply justifies their place in the aircraft dealer's picture.

It may be argued that the income from aircraft sales does not justify the investment in an elaborate sales set-up. We beg very politely to offer a distinct contradiction; first of all, such a statement is usually based on the lack of sales resulting from the inadequate efforts of the average dealer; secondly, the cost of the set-up described above is very small and would be more than absorbed by the commission from one additional sale.

It is true that the volume of sales in aircraft is far lower than that in automobiles, yet, if we keep our comparison on the same price level this difference is not so tremendous. Auto dealers featuring cars in the $4,000 and up class cannot expect the same volume as dealers handling Fords or Chevrolets. On the same percentage basis, one sale in the high-priced field is equivalent to many sales in the lowest-priced classes. The same argument applies in the sale of planes. Ten sales of any of the popular cabin planes on the market today, assure the dealer of a good income over and above all expenses. Yet, how many would-be dealers will make an investment similar to that of a high-priced car dealer? Very few will go beyond the purchase of a demonstrator.

Demonstrators

For an ideal dealer set-up worthy of the sales potential in the average community, at least 2 planes are desirable. One ship should be kept as a display model, available for immediate delivery. The other would serve continuously as a demonstrator. Extensive observation, however, forces the conclusion that few dealers would (or can) make this double investment. It is necessary, therefore, to plan our picture around a single ship.

When this plane is not in use it should be placed into its location in the hangar. Care in keeping it spotlessly clean and new-looking will help materially in creating a favorable impression. Frequent turn-over of dealer demonstrators is essential. The price reduction up to 75 hours need not exceed delivery cost. This procedure will materially reduce depreciation, and will enable the dealer to always have the latest model available for his sales work. Adherance to the factory advertised list price by the dealer is essential. Every real manufacturer will stand behind the dealer on such a policy. The days of chiselling and obtaining discount for *buying* instead of *selling* are practically gone. The manufacturer fully realizes the dealer's responsibility. He is entitled to his commission if he carries out the effort involved in selling, in disposing of trade-ins, and in extending service to the purchaser. In return for this job, the dealer should (and will) receive absolute price protection from any responsible manufacturer.

Merchandising Methods

The principal reason so few aircraft dealers have found it possible to obtain a livable profit from aircraft sales alone, is simply lack of merchandising ability. Too many consider the mere ability to fly a plane as sufficient ammunition to attack the potential market in their vicinity. The ideal dealer should possess a background of selling experience, for his problem is infinitely more complicated than that of the auto salesman. He must not only be able to present his product intelligently and convincingly from a technical as well as practical angle, but in most instances he must also overcome the instinctive fears and complexes, lack of confidence, violent prejudices and opposition on the part of the prospect's family, procastination and delay, and hundreds of other obstacles which seldom are involved in the sale of an automobile. He must have the knowledge and ability to do business with men whose income indicates business success. He must have initiative, aggressiveness, and a vast resourcefulness. He must know how to follow up prospects furnished him through the publication advertising done by the manufacturer. He must know how to write forceful and convincing letters. He must have vision to prepare campaigns to doctors, dentists, lawyers and other professional men—campaigns which will bring them to the airport and acquaint them with this most fascinating of recreations. He must have the personality to address groups at club luncheons. He must know how to obtain educational publicity in his local newspapers. He must be able to present propositions to large companies who need airplanes for transportation of executives. In other words, he must be a man whose flying ability is only incidental to his ability as a salesman, executive and educator. For such a man, the dealer franchise for a standard line of airplanes offers a good living even at this early stage. And for such a dealer, any real aircraft manufacturer will gladly extend cooperation and protection.

One of the most common mistakes made by the average dealer is the tendency to wait for prospects to materialize. As a result, he considers it necessary to have a large territory set aside for himself. Such practice is fallacious, as the sales costs of covering a large territory cannot be balanced by the income. Any live dealer can derive enough business from a half-million population to have a bank account at the end of the year. Ten sales in such an area, means only one sale to every fifty thousand population. And in this day and age, the airlines, aircraft magazines, newspapers, military propaganda, etc., have certainly created enough sub-conscious airmindedness to enable the aggressive dealer to find one man in every fifty thousand to whom an airplane can be sold. If every dealer in the country could qualify for such a quota, the manufacturer could then spend most of his sales appropriation in assisting the dealer instead of being forced to send his own men to forty-eight states doing a job that is inefficient as a selling method.

OPPORTUNITIES FOR THE AIRPLANE

(*Continued from page* 12)

in the airplane a valuable means of investigating food supplies and fishing grounds, and aircraft should also be useful for transportation and surveys in the administration of the salmon fisheries in Alaska and in enforcing sponge laws off

(*Continued on following page*)

(*Continued from preceding page*)
the coast of the state of Florida.

The Immigration and Naturalization Service of the Labor Department could transport its field officers much faster by airplane and could likely find other uses for it in the general administration of its duties.

A complete aerial photographic map of the United States should be of value to the Interstate Commerce Commission in supervising interstate carriers.

The Federal Power Commission, Federal Communication Commission and the two International Boundary commissions doubtless could very well use aerial maps to great advantage in their work. The International Boundary commissions (United States, Alaska and Canada, and the United States and Mexico) should find a complete photographic map of the United States with an overlap of the boundary countries of inestimable value.

Photographic maps would provide the Inland Waterways Corporation with much valuable information in connection with operation and maintenance problems.

The Board of Surveys and Maps of the Federal government, which was created for the purpose of making recommendations to the several departments or to the President for coordinating all map making and surveying activities of the Government and to settle all questions relating to surveys and maps, is at present making a comprehensive study looking toward the correlation of the map-making activities of its member organizations. These include: Lake Survey, Bureau of Soils, General Land Office, Bureau of Reclamation, Office of Indian Affairs, Army Air Corps, Division of Maps of the Library of Congress, Bureau of Aeronautics, Bureau of Air Commerce, Bureau of Foreign and Domestic Commerce, Geographic Section of the State Department, International (Canada) Boundary Commission, Division of Topography of the Post Office Department, Mississippi River Commission, Coast and Geodetic Survey, Federal Power Commission, Bureau of Lighthouses, Military Intelligence Division of the War Department, Bureau of Public Roads, Hydrographic Office, Corps of Engineers, Geological Survey and Forest Service.

The Board may wish to give serious consideration to the subject of a complete photographic map of the United States and its possessions. Such a map would prove of value not only to the Federal government as evidenced by the interest of the members of the board, but it would also be of benefit to the other agencies of the government which were mentioned in the foregoing as having a minor need for the information which can be obtained only from a map as adequate as one made from photographs made with aerial cameras.

The Federal government would be able to save a great amount of time and money, now, if such a map were available. It would be of great value in connection with new public works projects, waterways, reclamation of unproductive land, and drought prevention. The Reconstruction Finance Corporation and the Land Bank Division of the Farm Credit Administration could use this map to great advantage and practically all other departments and their branches would find it extremely useful.

THE NEW LUSCOMBE PHANTOM

(*Continued from page 37*)

cabin temperature and keep it free from engine fumes.

The development of a new forced cooling type cowl precludes the troubles through vibration of light weight aluminum previously experienced. This cowl offers instant accessibility to valve adjustment and engine accessories, and keeps head and oil temperatures below the approved engine rating at all speeds and under all conditions.

With a Warner Super Scarab the Phantom cruises at 142 miles an hour, has a top speed of 168 miles an hour, and with flaps down lands less than 45 miles an hour. It has a useful load of 650 pounds and a cruising range of 560 miles. The airplane will be available with the Warner 90 h.p. Junior, the 125 h.p. Scarab, or the 145 h.p. Super Scarab engines.

Specifications of the Luscombe Phantom with the 145 h.p. Warner Super Scarab are as follows:

Wing span	31 feet
Wing area	132 square feet
Length	21 feet 6 inches
Gross weight	1950 pounds
Useful load	650 pounds
Top speed	168 miles per hour
Landings, speed (flaps down)	45 m.p.h.
Cruising range	560 miles

A JUNKETER RIDES THE AIRWAYS

(*Continued from page 17*)

Newark instead of Chicago; so mine was the one case on record where a fellow with Form 13 ever got anywhere but exhausted.

Well, I told Harold that a joke was a joke but that I was growing old waiting for vacant seats, so he authorized the traffic department to ship me on a Form 12, which rates the same as a cash fare. After this I sailed right through and believed the ads about airlines saving you time and annoyance. My old friend Marion "Pop" Sterling was pilot on the next ship bound for Chicago, and it made me feel glad they'd thrown me off at Cleveland just so I could see him again. He turned the wheel over to the "Mate," as they quaintly term the co-pilots on United, and came back and chatted with me. When he learned that I was bound for Hollywood he gave me a can of insect powder to use in case the movie actors got in my hair.

At Chicago I had to wait over for the plane that had left New York at 9 p.m. and was scheduled to leave Chicago at 2 a.m. There was no place to go but to sleep, so I curled up on the leather benches in the Chicago terminal for about four hours and was only disturbed once when a porter asked me if I'd mind not snoring so loud as it made the waiting passengers think their plane was taking off and they would go rushing out in droves and creating a disturbance.

Meeting Old Pilots

Pilot R. W. Meskimen dragged me out of Chicago to Cheyenne, Wyoming; after we'd got in the air he came back and talked to me. Mighty pleasant it was meeting old pilots I'd heard about and had never met; and they'd never known me except in print, which my long-suffering friends maintain is the only safe way to meet me. All across the continent and back I was meeting the veterans whose skill and good judgment have played such a large part in building up our fine airlines. These boys do their splendid work day after day, year after year, in fair weather and storms, without benefit of publicity; but the marvellous transportation system which they are building will last, an enduring monument to their courage and their strength of character, long after more spectacular aerial achievements are forgotten.

I don't know of anything quite as soothing and restful as travel by air at night; the plane roars off into a mysterious and unknown darkness, and you sit there in the cabin looking out at a million lights and wondering at the ingenuity and the courage of men who have made this thing possible. And if you're an old pilot yourself you feel happy and perhaps a little proud to recall that you have had some small part in this great undertaking, this triumph of man over distance and time and danger. And you feel mighty humble, too, for you realize how tiny a part any individual has played in all of this; for it started away back in the dimness of prehistoric times when some smart savage discovered the wheel and others learned to work metals and fashion materials into this shape and that, and all with some Divine purpose in view which we cannot comprehend and probably never will.

It is very comfortable in the adjustable seats of those Boeings, and you have no difficulty in dropping off to sleep. You

(*Continued on following page*)

(*Continued from preceding page*)
wake up when they land at Moline, drop off again in the air, wake up at Iowa City, sleep a spell, then gaze at Des Moines an hour later. By the time you've dropped off, then waked up, and looked at Lincoln, Grand Island, and North Platte you've come to the conclusion that it is easy to go to sleep in an airliner and impossible to *stay* asleep. There is too much competition.

At Cheyenne Pilot Meskimen left us to hunt moose, or whatever abounds in Cheyenne, and Smiling John Hodgson climbed into the cab to drive old 97 to Salt Lake City. I call him Smiling John because he grinned every time he looked back at me. I guess I looked funny to him. He is evidently a bachelor, because I don't know any married men who ever look so cheerful.

At Cheyenne we looked down at an army post, Fort Francis E. Warren, useful in the old days of the Indian wars. Apparently the Army hasn't learned that all the Indians are now football players or oil magnates. At Bolster, Wyoming, we saw the Laramie Plains, famous in buffalo hunting days, and to the North was Robber's Roost, where bandits held up trains in pioneer days. There aren't any bandits there now—they're all in New York, Chicago, and Washington, D. C. It's a grand flight to Rock Springs and Fort Bridger, established by Jim Bridger, famous scout and Indian fighter, and over the Wasatch Range to Salt Lake City, passing over the old Mormon trail of 1847. From the map and air log which United supplies to every passenger you can see where you are most of the time and learn interesting facts about the route over which you are flying.

At Salt Lake City Pilot Jack O'Brien climbed into the cabin, took the throttle in his hand, and made another journey to the promised land of San Francisco. The Great Salt Lake Desert is one of the wonders of nature, not even forgetting Frank McKay; there's enough salt there to do the entire world for centuries and leave enough over to keep Huey Long from getting too fresh. The airport at Salt Lake City occupies part of the bed of old Lake Bonneville, which in the glacial period held water 900 feet above the present lake level. Not that anybody cares. The present lake is so salty that if you dive into it you bounce right back out again, like the Army did in the Air Mail business.

A strong cross wind on a narrow field made it inadvisable to land at Elko, Nevada, so we climbed up out of the pass, experiencing some of the most entertaining bumps I've ever encountered. We flew over Beowawe, and passed Battle Mountain to the north a little further on, where the old gold miners and the Piute Indians fought a bloody battle 74 years ago, then over the Carson Sink and on to Reno, where we deposited a disgruntled lady to await marital relief. The stewardess informed me that the gals usually go to Reno by train and return by air; I suppose they go there in a slow and pensive railroad mood and return by air because they're so happy they have to get back quick and tell their friends how good they feel being free. The one we dropped off was a hard blonde; I could imagine how pleased her husband must have been to know she was with us instead of with him. We didn't mind losing her, either.

On to California

After Reno we passed Lake Tahoe to the south, also Donner Lake, named for a party of pioneers snowbound there in 1848, of whom 36 perished. Then we passed Flat, Calif., and flew along the north fork of the American River over old placer gold mining territory. We saw the ghost towns of Whiskey Diggings, Angel's Camp, Hangtown, Poker Flat, Gold Run, and others made famous by the writings of Bret Harte. Remember "The Outcasts of Poker Flat"? You lose your sense of reality and feel like a character in romantic fiction when you pass over those places. Then you fly over the fertile Sacramento Valley and become modern and commercial again, more's the pity, and half an hour later you are flying over San Francisco Bay and landing at the magic city that is different from any place in the United States. From the air San Francisco is the most lovely city I have ever seen, and I've seen quite a few. It is surrounded by the Bay, the Pacific Ocean, and Mike Doolin, who is as much a part of the scene as the seals on Seal Rocks. I had dinner with this old settler, and the next day he took me for a flight of an hour or so over the city, the Golden Gate, San Mateo, Oakland, Berkeley, and other places. I looked down on San Quentin Prison where 4,000 citizens are sitting quietly thinking things over. They're putting up a new building, so I presume that business in the prison line is picking up.

Next day I flew to Los Angeles with Dick Bowman, an old United pilot and one of the best in the business. At Palo Alto I looked around for Hoover, but he was evidently hiding. He's not taking any chances of their finding him and shoving him back in the White House.

At first glance Los Angeles and surrounding cities look like Cleveland, Ohio, with palms, Neon lights, and more filling stations, with Sister Aimee pronouncing a benediction on the whole. Then, as you look it over and overlook the movie actors swinging by their tails from the trees, you begin to sense a magnificent surge of life in this sun-bathed plain nestling between high mountains. The people here are vibrantly alive, and most of them are happy and working; there's nothing stodgy or dull about Los Angeles and its people. I liked the place immensely, but I think that living there indefinitely would be rather a strain on a quiet old man.

Seen from above at night, from a TWA Douglas airliner, Los Angeles is an intricate pattern of sheer beauty done in light; the wide boulevards stretch for miles and miles, bisected by narrower streets, the whole making a mosaic in light that no city in the world can quite equal. As a frame there are the mountains, great blobs of mysterious dusk splashed at the edges of the picture. You wing away from Los Angeles amused at its insanities and inanities, awed by its actual accomplishments. These people have transformed a dry plain into a lovely garden filled with flowers and trees and grass; no wonder that the sane and the insane flock here in almost equal numbers. The verdure grows only by a virtue of constant waterings; forget to water your lawn to-night and it will be brown to-morrow. A chap who arrived in a green suit forgot to water it, and found next day that he was wearing a brown suit. Just goes to show!

Art Burns was the pilot who rescued me from Hollywood just as I began to imagine that I was King Kong chasing Fay Wray from tree to tree. He flew me via Kingman and Winslow to Albuquerque, where Carl Rach took over the ship and flew it to Kansas City. Pilot S. C. Welsh brought us to New York. I'm sorry that lack of space forbids a detailed description of the return trip on TWA, shortest and fastest route from coast to coast. But that's only an excuse, to tell you the truth. California, accompanied by Jerry McClelland, Warren Carey, Big Chief Pants-at-the-ankles Stearman of the Wichita tribe, One-shot Doolin and other fearsome fauna of those parts had worn me down to a point where all I could do was sleep. And that fine Douglas airliner is built for sleep; it's the quietest and fastest transport plane that I've flown in and the seats are the most comfortable. I slept all the way to Wichita, and most of the way to New York, with the usual awakening for landings en route, which seems unavoidable.

Leaving Los Angeles on *The Comet* at 9 p.m. Pacific time I arrived at Newark, at 4:57 p.m. Eastern time, less than 17 hours' flying time with seven mail stops. *The Sky Chief*, leaving at 4 p.m., arrives at Newark at 10:55 a.m., making only four stops, at Albuquerque, Kansas City, Chicago, and Pittsburgh. The modern trains take nearly five days; the first transcontinental railroad took 7 days in 1869. In 1856 the stage coach took 21 days from St. Louis, while in 1830 an ox team took six months and six cases of Budweiser from St. Louis. Believe me, the modern way to travel is by air.

Books For Sale by the Aeronautical Library

ELEMENTARY (GENERAL)

Dick Byrd—Air Explorer. *Green*.....$1.75
Everyman's Book of Flying. *Orville Kneen*..$3.50
Fighting the Flying Circus.
Capt. Eddie Rickenbacker.....$2
Flying and How to Do It. *Assen Jordanoff*...$1
If You Want to Fly. *Alexander Klemin*.....$2.50
Riders of the Winds. *Edward Shenton*.....$2.50
Skycraft. *Augustus Post*.....$3.50
Skyward. *Commander Richard E. Byrd*.....$3.50
The First World Flight. *As related by the fliers themselves to Lowell Thomas*.....$5

BALLOONS AND AIRSHIPS

Aerostatics. *E. P. Warner*.....$4
Airship Design. *Charles P. Burgess*.....$9
Balloon and Airship Gases.
C. deF. Chandler & W. S. Diehl.....$4
Free and Captive Balloons.
R. H. Upson & C. deF. Chandler.....$5
Men Working. *Norman Beasley*.....$3
Pressure Airships.
T. L. Blakemore & W. Watters Pagon....$8
Up Ship! *Lt. Comm. C. E. Rosendahl*.....$3

DESIGN, CONSTRUCTION, OPERATION

Aeroplanes, Seaplanes and Aero Engines.
Capt. P. H. Sumner.....$4
Aircraft Float Design.
Holden C. Richardson, M.S......$5
Airplane Mechanics' Rigging Handbook.
R. S. Hartz.....$3.50
Airplane Pilot's Manual. *Ross Mahachek*.....$2.50
Airplane Welding. *J. B. Johnson, M.B.*.....$3.50
Airplane Structures.
Alfred S. Niles & Joseph S. Newell.....$5
Marine Aircraft Design. *Wm. Munro*.....$4.50
Metal Aircraft Construction (revised edition).
M. Langley.....$4.50
Oxy-Acetylene Welders' Handbook.
M. S. Hendricks.....$3
Procedure Handbook of Arc Welding, Design & Practice.....$1.50
Screw Propellers (3rd Edition, 2 Vols.).
Chas. W. Dyson.....$5

ENGINEERING

Aerodynamic Theory. *W. F. Durand*.....$7
Airplane Stress Analysis. *Alexander Klemin*..$7
Dynamics of Airplanes and Airplane Structure.
J. Younger & B. Woods.....$3.50
Elements of Aerofoil and Airscrew Theory.
H. Glauert.....$5.60
Engineering Aerodynamics. *W. S. Diehl*.....$7
Fundamentals for Fluid Dynamics for Aircraft Designers. *Dr. Munk*.....$8
Principles of Aerodynamics.
Dr. Max M. Munk.....$1.75
Principles of Flight. *Edward A. Stalker*.....$6
Simple Aerodynamics and the Airplane (4th revised edition). *Col. C. C. Carter*.....$4.50
Stresses in Aeroplane Structures.
H. B. Howard.....$5

ENGINES

Aircraft Engine Instructor. *A. L. Dyke*.....$5
Aircraft Engine Mechanics Manual.
C. John Moors.....$4.50
Aviation Engine Examiner. *Major V. W. Page*.$3
Automobile and Aircraft Engines.
A. W. Judge. (Revised).....$10
Aviation Chart. *Lt. V. W. Page*.....30c
Diesel Handbook. *Julius Rosbloom*.....$5
Engine Dynamics and Crankshaft Designs.
Glenn D. Angle.....$4
High Speed Diesel Engines. *Arthur W. Judge*.$4
Modern Aviation Engines.
Victor W. Page (2 volumes), *per volume*...$5
Set of 2 volumes.....$9
Modern Diesel Engine Practice.
Orville Adams.....$6
Principles and Problems of Aircraft Engines.
Minor M. Farleigh.....$3

FICTION

Night Flight. *A de St.-Exupery*.....$1.75
Sky Larking. Bruce Gould.....$2.50
The Right to Solo. *R. W. Kessler*.....$2
The Rise and Fall of Carol Banks.
E. W. Springs.....$2.50
Wonder Book of Aircraft.
Harry Golding, F.R.G.S......$2.75

GLIDERS

A B C of Gliding and Sailflying.
Maj. V. W. Page....Cloth binding, $2; paper, $1
The Book of Gliders. *E. Teale*.....$1
Gliders and Gliding. *R. S. Barnaby*.....$3

INSTRUMENTS

Blind Flight. *By Maj. Wm. C. Ocker & Lieut. Carl J. Crane*.....$3
Instrument Flying. *Howard Stark*.....$2
Measurement of Fluid Velocity and Pressure.
J. R. Pannell.....$4

LANDING FIELDS AND AIRWAYS

Air Conquests. *W. J. Davis*.....$3

MATERIALS

The Materials of Aircraft Construction.
F. T. Hill.....$5
Manufacture and Use of Plywood and Glue.
B. C. Boulton.....$2.25
Metallurgy of Aluminum and Aluminum Alloys.
Robert J. Anderson.....$7.50
Engineering Materials (Volume I) Ferrous.
A. W. Judge.....$8.50
Engineering Materials (Volume II) Non-Ferrous and Organic Materials. *A. W. Judge*..$7.50
Engineering Materials (Volume III) Theory and Testing of Materials. *A. W. Judge*....$6

MODEL AIRPLANES

Beginners' Book of Model Airplanes.
C. H. Claudy.....$1.75
Building and Flying Model Aircraft.
Paul Edward Garber.....$2.25
Complete Model Aircraft Manual.
Edwin T. Hamilton.....$3.50
Miniature Aircraft. How to Make and Fly Them. *O. H. Day & T. Vincent*.....80c
Model Airplanes. *Joseph Ott*.....$2.50
Prize Winners' Book of Model Airplanes.
C. H. Claudy.....$3
The Skycraft Book. *Laura B. Harney*.....$1.25

NAVIGATION AND METEOROLOGY

Aerial Navigation & Meteorology.
Lewis A. Yancey (new edition).....$4
Aeronautical Meteorology. (Revised edition).
W. R. Gregg.....$4.50
Aircraft Radio. *Myron F. Eddy*.....$4.50
Air Navigation and Meteorology.
Capt. Richard Duncan, M.C......$3
Air Navigation for Private Owners.
F. A. Swoffer, M.B.E......$2.25
Altitude & Azimuth Tables for Air & Sea Navigation. *Collins & Roden*.....$2
An Analysis of Meteorology.
Harold Lewis Kirby.....$4
Avigation by Dead Reckoning.
Captain Tenar E. Elm.....$2
Cloud Studies. *A. W. Claydon, N.A.*.....$4.50
Force of the Wind. *Herbert Chatley*.....$2
Line of Position Book. *Lt.-Com. Weems*....$2.50
Man and Weather. *Alexander McAdie*.....$2
Meteorology for Aviator and Layman.
Richard Whatham.....$3
Navigation and Nautical Astronomy. *Capt. B. Dutton*.....$3.75
Simplified Aerial Navigation.
J. A. McMullen.....$2
Simplified Time-Chart of the World.
Chas. M. Thomas.....25c
The Navigation of Aircraft. *Logan C. Ramsey*.$4.50
The Navigation of the Air and Meteorology.
Capt. Leslie Potter.....$4
Weather. *E. E. Free and Travis Hoke*.....$3
Weather and Why. *Capt. I. E. Elm*.....$2.50

PARACHUTES

Jump. *Don Glassman*.....$3
Parachute. *Charles J. V. Murphy*.....$2.50
Parachutes for Airmen. *Chas. Dixon*.....$2.50

PHOTOGRAPHY

Aerial Photographs. *Lt. Reeves, A.C.*.....$5
Airplane Photography. *H. B. Ives*.....$4
Applied Aerial Photography.
Capt. Ashley C. McKinley.....$5
Multiple Lens Aerial Cameras in Mapping.
Fairchild Aerial Camera Corp......$5

TRANSPORT & COMMERCIAL AVIATION

Economics of Air Mail Transportation.
P. T. David.....$2
An Introduction to the Economics of Air Transportation. *Kennedy*.....$2
Principles of Transportation. *E. R. Johnson, G. G. Hubner and G. L. Wilson*.....$5
Transport Aviation (2nd Edition).
Archibald Black.....$4

YEAR BOOKS

All the World's Aircraft. 1933—*Jane's*.....$14.75
Junior Aircraft Year Book for 1934.....$1.50

Prices Include the Postage

AERO DIGEST • 515 Madison Avenue • New York

Remit by Money Order or Check

INDEX TO ADVERTISERS IN THIS ISSUE

ADVERTISERS' LITERATURE SERVICE

IMPORTANT: For the convenience of those who are in the market for any of the products or facilities advertised in this issue. Read carefully, before filling out the coupon, the advertising of the items in which you are interested. Be sure to mention the company with which you are associated, and your position.

AIRCRAFT

Literature on the following available to dealers, operators, private owners, business houses:

1. AERONCA—Two-place, side by side, light plane, less than $2,000 ..... Page 65

2. BEECHCRAFT—Four- or five-place, high performance cabin; 225 h.p. to 690 h.p... Page 59

3. FAIRCHILD — Two - place, open and three-place cabin, high wing ..... Page 21

4. LAMBERT—Two-place, high wing, cabin; choice of several engines ..... Page 71

5. LUSCOMBE—High performance, two-place, metal, cabin. Page 57

6. PORTERFIELD — Two-place, high wing, tandem cabin, less than $2,000 ..... Page 63

7. TAYLOR — Two-place, high wing, tandem open cockpit, less than $2,000 ..... Page 69

44. RYAN — The Ryan ST, product of Ryan Aeronautical Corp., 2-place low-wing all-metal; Menasco-powered. Page 53

8. WACO—Complete line open and cabin planes, biplane models, wide range of engines. Page 67

Literature on the following available to United States and foreign airline operators and military authorities:

9. BOEING "247" — High speed, all metal, low wing, passenger, mail and express plane. Two engines; 10 passengers and crew ..... Page 47

10. DOUGLAS—High speed, all metal, low wing, passenger, mail and express plane. Two engines; 12 passengers and crew.. Page 6

ENGINES

Literature on the following available to aircraft manufacturers, engineers, designers, airline officials and other users of high-powered aircraft engines, Army and Navy officials, etc.—here and abroad:

11. PRATT&WHITNEY—Wasp and Hornet series air-cooled engines; direct drive, geared, supercharged..... Second Cover

12. WRIGHT—Whirlwind and Cyclone air-cooled engines; direct drive, geared, supercharged; also Conqueror series, liquid-cooled engines ..... Page 19

AIRCRAFT & ENGINE EQUIPMENT

Additional data on the following available to manufacturers, engineers, designers, operators, repair stations, government air services, etc.; also to aircraft owners in the market for replacements:

13. BERRY BROS. — Aircraft dope, lacquers, high grade finishes ..... Page 71

14. B. G.—Spark plugs, mica; regular and radio shielded types. Page 2

15. ECLIPSE — Aircraft engine starters, generators, dynamos, landing gear motors. Back Cover

16. EVANS — Aircraft fuel pumps; spring loaded flexible sylphon seal, flexible shaft, integral relief valve, wabble pump bypass ..... Page 56

17. FLEETWINGS—"Shotweld" system stainless steel construction; "shotweld" stainless steel gasoline tanks ..... Page 59

18. GOODRICH —"Silvertown" airplane tires; 40 other rubber products for aircraft.... Page 33

19. HAMILTON STANDARD—Controllable pitch steel propellers ..... Page 35

20. KOLLSMAN—Precision aircraft instruments, individual direct lighting, clamp-type mounting ..... Page 3

21. MACWHYTE— Streamline, square and round tie rods; cable; slings ..... Page 65

22. NATIONAL TUBE — National-Shelby seamless aircraft tubing; made to U. S. Army and Navy specifications.... Page 61

23. ROMEC — Aircraft fuel pumps; positive rotary type. Also lubricating pumps, vacuum pumps, combination oil pressure and vacuum pumps..... Page 63

24. S K F—Dependable ball and roller bearings for important aircraft engine parts.... Page 41

25. THOMPSON—Intake and exhaust valves; hollow head and stem type, and cupped head and solid stem ..... Third Cover

26. B. A. 30—Balloon and airplane cloth, made by Wellington Sears Co. Grade A, meets all Army and Navy spec... Page 69

27. WITTEK—"Noc-out" hose-clamps, with thumb screw, insure tight connections ..... Page 63

MISCELLANEOUS

The following companies will gladly send their literature to those who are interested in the particular products advertised:

28. AMERICAN—Steel sheets, the product of American Sheet & Tin Plate Co., for hangars, shops, sheds, culverts... Page 65

29. LYMAN—The Cutts Compensator for hunting, skeet, traps. Product of the Lyman Gun Sight Corp..... Page 71

30. N-B—All aircraft, engine and pilot supplies are listed in the Nicholas-Beazley catalog. Page 69

31. WESTPORT — Long-range aircraft radio receivers; also ground station radios. Distributed by Pacific Air. Corp. Page 58

32. RONALD — The Ronald Press library contains 28 technical and non-technical aviation books of value to students, pilots, mechanics and engineers. Page 80

45. ORT—Karl Ort's new catalog of aviation supply bargains (enclose additional 10c in stamps for this catalog)..... Page 60

SCHOOLS

School literature is available to everyone contemplating a course in aeronautical training:

33. BOEING — Oakland, Calif. Courses include: Master Pilot, Special Master Pilot, Airline Operations, Ltd. Com. Pilot, Private Pilot, Amateur. Page 61

34. CURTISS-WRIGHT—Glendale, Calif. Courses include: Aeronautical Engineering, Mechanics ..... Page 1

35. DALLAS — Dallas, Texas. Courses include all classes of pilot and mechanic training, aviation radio ..... Page 7

36. CASEY JONES—Newark, N. J. Courses include: Aeronautical engineering, mechanics, instrument flying ..... Page 71

37. LINCOLN — Lincoln, Neb. Courses include all grades of pilot, and mechanic..... Page 63

38. PARKS—East St. Louis, Ill. Courses include: Executive Transport Pilot, Aeronautical Engineering, A & E Master Mechanics, Ltd. Com. Pilot, A & E Mechanics ..... Page 5

39. RYAN—San Diego, Calif. Courses include: All grades of pilot and mechanic training; aerial navigation ..... Page 43

40. ROOSEVELT —Mineola, N. Y. Courses include: Amateur, Private, Ltd. Com., Transport Pilot; regular and Master Mechanics ..... Page 67

41. SPARTAN — Tulsa, Okla. Courses include: Flying, mechanics, radio-instrument, executive-management ..... Page 51

42. STEWART — New York, N. Y. Specializes in airplane engine master mechanics. Page 69

43. TRI-STATE—Angola, Ind. Two-year aeronautical engineering course ..... Page 76

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number.

CHECK HERE: Name .....

No..... Position .....

No..... Company .....

No..... Address .....

No..... City and State 9-34

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

UNIVERSAL PROPELLERS

Special price on few test props, $24.50; used K-5 Hartzell, OX-5 and Velie M-5. All guaranteed in perfect condition

UNIVERSAL AIRCRAFT SUPPLY CO.
2300 N. 9th Street St. Louis, Mo.

PARTS

NEW AND USED
60% to 80% Off
Write for complete list
AIRPLANE PARTS AND SUPPLIES, INC.
1416 N. San Fernando Rd., Glendale, Calif.

N. A. C. A. Cowling Specialists

METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter
MAGOSY & BUSCHER
120-126 Walker Street, New York, N.Y.

San Fernando & Raymond - - Glendale, Calif.
LIEUT. W. S. HAWKINS
AIR-PARTS 70-85% OFF
A DEPENDABLE COMPANY

All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velie, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

A COMPLETE LINE
TITANINE
THE WORLD'S PREMIER
DOPE
TITANINE, INC.
MORRIS & ELMWOOD AVES.
Union, Union Co., N. J.

"INSTRUMENT FLYING"

By Howard Stark
80 pages. 25 illustrations. Flexible cover.
$2.00 postpaid.
A method of locating the radio beacon station.
James Stark, Pawling, N. Y.

selected clear aero sitka
SPRUCE

For quick shipment from Chicago, rough or finished to exact size. For airplanes, gliders, iceboats, etc.
Lowest Wholesale Prices
Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.
Come to Us for Good Spruce
PIKE-DIAL LUMBER CO.
Airplane Lumber Specialists—2251 Loomis St., Chicago
We also carry "Plycor" aircraft plywood

AERONAUTICAL RADIO CO

ROOSEVELT FIELD MINEOLA N. Y.
Telephone Garden City 6770
Radio Shielding for all types of motors; Western Electric Aircraft Radio; Hurley-Townsend Radio-Shielded Plugs; Westport Aircraft Radio; Transmitting Equipment.

AERO BLUE BOOK

"The Bible of the Industry"

gives specifications of over 350 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Also present second-hand market value of popular ships. Only information of its kind. Required over one year to compile. Almost priceless to students, engineers, dealers, enthusiasts. **$1.00** postpaid

FREE! If you order now, your choice "How to Choose a Flying School" or "Points on Buying a Used Airplane." Send now!

NATIONAL DISTRIBUTORS
922 Pine St., St. Louis, Mo.

SUBSCRIBERS

WHEN moving, be sure to send your change of address to the Circulation Department, AERO DIGEST, 515 Madison Avenue, New York, N. Y. Prompt attention to this detail will obviate any delay in the receipt of your copies. When writing please include your old address with the new.

MAGNETOS!

We have complete Stocks of SCINTILLA mags and parts at absolutely lowest prices!
Coils—Points—Cams—Gears
Supply Division, Inc.
Robertson, Missouri

STAINLESS STEEL TIPPED
PROPELLERS
FLOTTORP PROPELLER CO.
1836 Linden Ave., S. E.
Grand Rapids, Michigan

STREAMLINES

Cowlings and Wheel Pants
Metal Spinning, Sheet Metal Specialties
HILL AIRCRAFT STREAMLINERS CO.
814-16 Reedy St. Cincinnati, Ohio

Phenix Clear Nitrate Dopes

Clear—$1.05 per gal. in 50 gal. Drums Included
—$1.10 per gal. in 30 gal. Drums Included
—$1.20 per gal. in 5 gal. boxed cans
Pigmented—$1.90 per gal. in 5 gal. boxed cans
Yellow, Blue, Green, Cream, Khaki, Aluminum, Black, White. Immediate shipments fresh high grade.
"Send ½ the cost with C. O. O. shipments"
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

KEEP YOUR COPIES *of* AERO DIGEST IN A BOUND VOLUME
Attractive and durable binding at special rates to AERO DIGEST subscribers
MANHATTAN BOOKBINDERY
240-242 W. 23rd St., New York, N. Y.
Phone CHelsea 3-7204

PATENTS—TRADE MARKS

All inventions submitted beld confidential and given personal attention by members of the firm.
Form "Evidence of Conception" and instructions
"How to Establish Your Rights"—Free
LANCASTER, ALLWINE & ROMMEL
PATENT LAW OFFICES
472 Bowen Bldg. Washington, D. C.

MAX M. MUNK

Registered Patent Attorney
Grad. Mech. Engineer
Doctor of Engineering
Ph.D.
Member Virginia Bar
Technical Author
Rendering professional service of highest standard to government and private parties here and abroad since 1915.
1734 Eye St., N. W. Washington, D. C.

Royal E. Burnham

Attorney-at-Law
Patent and Trade Mark Causes
511 Eleventh St., N.W., Washington, D.C.

FOR SALE

MISCELLANEOUS
40 Airplanes
29 Engines
Lights—landing, navigation
Fuel Pumps
Generators G1-G2
Oil and Fuel Line Fittings
Oil Reclaimers
Safes
Instruments
Starters and Parts
Propellers and Parts
Plywood (3-Ply Birch)
Goodyear Airwheel Parts

Aircraft Cable
Radio Receivers
Radio Parts R. C. A., W. E., S. C.
Tools and Shop Equipment

AIRPLANE PARTS
Stinson Parts—Models "S" Jr., SM1-D, SM6-B, SM6000-B
Ford Airplane Parts—5 AT
Fokker Parts—S. U. and F10A
Travelair Parts—(Model 4000)
Stearman Parts—(C3B-C3MB-4CM1-LT1)
Pitcairn Parts—(PA5-6-7)
Fairchild Parts—(FC2-FC2W2-71)
Bellanca Pacemaker Parts
Pilgrim Parts—(100A and 100B)

ENGINE PARTS
Wright Engine Parts—J-6-5, 7, 9 and J-5 Cyclone E, Gypsy
P & W Engine Parts—Wasp B & C-Wasp Jr. Hornet A-A1-A2-B-B1-C
Kinner Engine Parts—K5-B5-C5
Ignition Harness—Shielded & Unshielded
Spark Plugs
Magnetos and Parts
Carburetors and Parts

This is not a complete list. Additional equipment is being constantly received.
Descriptive price lists mailed immediately upon request covering class of stock in which you are interested.
Reasonable prices. New engine parts 50 per cent off list—used parts 80 per cent off list.
ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED
Please order by part number where possible.
American Airways, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

Research
Design
Stress-Analysis

Manufacturing
Flight-Testing
Operations

GRANVILLE, MILLER & DE LACKNER
CONSULTING
AERONAUTICAL ENGINEERS
SPRINGFIELD AIRPORT, SPRINGFIELD, MASS.

MOTOR PARTS
for all Models and Types

New and Used; constantly bought and sold. Also: Instruments, starters, generators, propellers, air wheels.

Reasonable Prices

AIRCRAFT SALVAGE & SUPPLY CO.
Hangar 32, Roosevelt Field, Mineola, N. Y.

A FEW SPECIALS

Rieker Pitch & Bank Indicators, $5; Irving Parachute Harness, unused, $12; Scintilla Magneto Switches, each $4; Aeromarine Liberty Starters, now $20; Wasp Main Crankcase, $150; J-5 Airmaze and Heater Assembly, new, $12; Carburetor, $25; Cylinders set (9), $100; Pistons, $2; Oil Pumps, $12; Fuel Pumps, $10. Hornet, Cyclone, Kinner, Challenger, Eaglerock Parts, Instruments, Wheels, etc. *Let us quote.*

DYCER AIRPORT
9401 So. Western Avenue Los Angeles, Calif.

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

AIRPLANES FOR SALE

AVAILABLE FOR IMMEDIATE DELIVERY

17 Lycoming Stinson Trimotors	Big Spring, Cleveland, Tulsa, Dallas, Nashville, Chicago, Detroit, Albany	$4,500 to $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit, Ft. Worth	8,500
4 Wright Cyclone R 1820 E Pilgrims	Cleveland, Albany, St. Louis	8,500
2 Wright J-6-9 Bellanca Pacemakers	Cleveland	4,000
2 Wright J-6-9 Stinson SM1-D	Cleveland	2,500
3 Wright J-6-9 Stearman 4CM1	Cleveland, St. Louis, Dallas	5,000

THIS AIRCRAFT is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.

CASH OFFERS are requested to include newly overhauled engines installed and "NC" License.

In the event of export, all such shipments of aircraft will be covered by Export Airworthiness Certificates.

UPON REQUEST we will quote C.I.F. any desired Seaport or O.O.F. where now located.

Photographs to responsible buyers.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED

American Airways, Inc., Sales Div., Municipal Airport, Cleveland, Ohio

Branch Office—Sales Division, 45 Vanderbilt Ave., New York City

---

AIRPLANE ENGINES AND PARTS

25 rebuilt Curtiss OX-5's—$48 each; 15 rebuilt Hisso A's—$72 each; 10 rebuilt Hisso E's—$96 each. Many parts for Wright J-5, J-6, Pratt & Whitney Wasp, Cirrus, Kinner, Liberty, Hisso, OX-5 and OXX-6. Let us quote you on your requirements.

Machine work on all types of engines, including Cylinder Grinding, Valve Guides, Valve Inserts and Bearing Rebabbitting.

HECKMAN MACHINE WORKS, INC.
Aeronautical Machinists
4026 W. Lake St. Chicago, Ill.

WACO AIRPLANES

FOR SALE

HIGH CLASS USED AIRPLANES: Wacos, Lockheeds, Monocoupes, Birds; many others.
Gov't approved Repair Station
Gov't approved Flying School
Ships for charter

ERICKSON & REMMERT
Hangar 6, Floyd Bennett Field Brooklyn, N. Y.
Telephone: Nightingale 4-2100

New Stinson Reliant

Delivery from Stinson factory May 4, 1934. Has been flown only 40 hours. Lycoming 245 h.p., Smith controllable pitch propeller, wing flaps, Kollsman altimeter, landing lights, flares, extra gas tank, directional gyro compass, bank and turn, special paint job, red leather upholstery; Lear radio complete. Cost $8,221. Change in plans reason for selling. Will sacrifice.

C. H. McALEER 7401 Lyndon Avenue Detroit, Michigan

LAIRD PLANES

LAIRD—Whirlwind, Wright J-5—220; LAIRD—Speedwing, Wright J-6—330; LAIRD—Junior Speedwing, Ranger 120; Stinson Jr.: Late Reliant Executive Model. Send for complete list guaranteed used planes.

E. M. LAIRD AIRPLANE CO.
5301 West 65th St., Chicago, Ill.

For Sale: Certified Used Ships

All ships licensed. Excellent condition. Trade or terms to responsible parties.

WACO SALES

OF NEW YORK, INC.
Hangar 16, Roosevelt Field, Mineola, N. Y.
N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

DETROIT AERO MOTORS CO.

14019 Hamilton Ave., Highland Park, Mich.

FOR SALE—AIRCRAFT ENGINES: Wright Cyclone, Model E, 22 hrs. since major, complete with Standard Steel propeller and electric inertia starter, $650; Warners, 110 h.p., $300; Continentals A70-1, 165 h.p., $350; Continentals A70-2, 165 h.p., $450; Wright J-5's, 220 h.p., $300; Wright J6-5's, 165 h.p., $350; Lycoming R-680, 210 h.p., $450. Warner 125 h.p., brand new, $500. All above motors just been reconditioned.

WE BUY AND SELL AIRCRAFT ENGINES

Write for lowest prices on Standard dope and fabric.

"On the Market"

"On the Market" is THE SPORTSMAN PILOT'S attractive page for the advertising of used planes, engines, accessories.

To cover the aviation industry: the dealers, schools, commercial operators and pilots, etc., AERO DIGEST'S "Planes and Engines" section is the logical place to advertise. But to do a really thorough job you also should reach the private flier. Although he is not necessarily a part of the aviation industry, the private flier uses his plane for the pursuit of sport. The airplane, to him, is purely a luxury. It is safe to assume, then, that he has the sort of income which makes advertising profitable.

"On the Market" is very economical. The rate is only $5 per column inch—two inches wide by one or more inches deep—payable in advance.

Advertising copy for the September fifteenth issue of THE SPORTSMAN PILOT *should be received before September tenth.*

THE SPORTSMAN PILOT
515 Madison Ave., New York, N. Y.
PLaza 3-6969

FOR SALE

Laird-Wasp 420 h.p.; Taper Wing Waco J-5; Aristocrat J6-5; Eaglerock OX-5; Stinson Lycoming; Fairchild 22, Cirrus; Fairchild 24, Cirrus; Travel Air 4000, J6-5; Monosport Warner.

HOEY AIR SERVICES
Hangar No. 3, Floyd Bennett Field, Brooklyn, N. Y.
Tel.: Nightingale 4-4200

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale

The Vimalert Company, Ltd.
835 Garfield Avenue, Jersey City, N. J.

ENGINES

PARTS AND ACCESSORIES BOUGHT—SOLD

Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasco, etc. Also starters, generators, propellers, instruments, wheels and parachutes.

WRITE FOR PRICE LIST FRANK AMBROSE

AERO SALVAGE CORP.
Glenn Curtiss Airport, Jackson Heights, N. Y.

AERO BROKERAGE SERVICE COMPANY
E. L. ERICKSON
LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA
"Selling the World Over"

COMPLETE STOCK OF USED PARTS
for practically all engines.
Prices between 60 and 70% off list.
WRITE FOR NEW PRICE LIST.

ENGINE BROKERS

Hangar "B," Roosevelt Field, Mineola, N.Y.

FOR SALE OR EXCHANGE

The following engines completely overhauled: Wright Whirlwinds 5, 7, 9, Type A—D. Continental 165's. Wasp B and C. Challengers, Kinners. Eclipse starters and generators; parts & accessories bought & sold.

Don Walling Wm. Wieland

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

AUTOGIRO: Pitcairn, Kinner 125 h.p. motor; Heywood starter, steel prop. Brakes, airwheels, in perfect condition. $1,500. Fred Vilsmeier, H and Luzerne Sts., Philadelphia, Penna.

RYAN B-1: Privately owned, hest of care; new prop; complete overhaul; new brakes, tail wheel; cheap for cash or trade. W. W. Clark, Portsmouth, Ohio.

SIMPLEX with Warner: Top overhaul, steel prop, oleo and air wheels; privately owned, very little time, special paint joh, cheap. Cbarles Hurtb, c/o Hurtb Hotel, Portsmouth, Ohio.

FOR SALE: Kinner Fleet, excellent condition, just relicensed. Total time, 570 hours. Price $1,175. Gus Bondy, 157 Owasco Rd., Auburn, N. Y., or Syracuse Airport, Syracuse, N. Y.

AMERICAN EAGLE: Three-place: OX-5; reconditioned, never cracked, always bangared. Guaranteed. $250 cash. Stored at present. Trenton Wall Paper Supply Co., Inc., 320 S. Broad St., Trenton, New Jersey.

WACO 9: Licensed until June 1935. New prop and oversize dropcenter tires; fuselage like new. Plane and motor in excellent condition. Deliver for expenses. $450. Luther West, 669 Milwaukee, Menasha, Wisconsin.

LAMBERT MONOCOUPE: Excellent condition, motor recently majored. Ring, hrakes, metal propeller. Licensed to Decemher 1934. In New York area. $1,425 cash. AERO DIGEST, Box 1857.

LAIRD J-5 4C: Biplane. Excellent condition. Controls and instruments in both cockpits. Licensed to March 1935. Price $1,650. Accept light car on plane. Ike Sewards, 552 First St., Chillicothe, Illinois.

TRAVEL AIR OX: Light weight job; covering A-1 special joh; blue fuselage, aluminum wings; motor complete overhaul; extra motor; licensed. $750. Muskogee Air Service, Box 446, Muskogee, Oklahoma.

FOR SALE: J-5 Fairchild FC-2. 5-place. Motor majored. Just relicensed. Velie parts. LeBlond 60. WANTED: LeBlond Davis, Great Lakes. AERO DIGEST, Box 1868.

WACO MODEL A: Warner. Total time, 175 hours. Pants, brakes, winter enclosure, speed ring, like new, $2,250. Stearman 3-place, with J6-7. Recently recovered; excellent condition. Sell or trade on Waco cabin. Kinner Fleet: 45 hours on motor. Airwheels, compass, turn and hank, air speed. Priced to sell. Meinke-Eldred Flying Service, Willoughby, Ohio.

WACO 10: Licensed March '35; motor good, top Millerized; ahout 400 hours on ship. Bargain, $500. Also Waco 10 parts. Peter Johnston, Milan, Michigan.

NEW ARROW SPORT: LeBlond 65. 40 hours total. Licensed July, 1935. Perfect condition. Privately owned. Always hangared. Never cracked. $800. N. H. Vance, Shenandoah, Iowa.

J-5 EAGLEROCK: $985. Good condition; excellent ship for banner towing. J-5 RYAN B-1: $1,200; good covering; smootb engine, new magnetos, new tires, new propeller; total time 250 hours. HISSO 180 TRAVEL AIR: $1,100; special high gloss rubhed finisb in red and hlack; hank and turn, rate of climh; completely major overbauled engine. OX-5 CHALLENGER: $400; good shape. Dick Schall, Berwyn, Maryland. Telephone: Berwyn 70.

OX ROBIN: Air wbeels, Millerized, Scintilla magneto, Stinson finished. Whittelsey Avian, air wheels, wing slots. Both licensed until 1935. Lester Lightfoot, Route 1, Gary, Indiana.

FOR SALE: 3-place licensed OXX-6 Swallow, equipped with Scintilla magneto and one Bosch, steel propeller; price $475 or accept light car in trade. John Ruzicka, Hoxie, Kansas.

STRAIGHT WING WACO: J-5; engine just major overhauled; Heywood starter, Bendix hrakes, Standard steel propeller; splendid condition throughout. $1,350. Martin Devereaux, 1366 McBride, Far Rockaway, New York.

$135: WACO 10 with OX-5 motor; needs two panels. Taylor Cub, 25% damaged with good Continental motor, $200. Inspection by appointment only. Pioneer Airport, Syracuse, N. Y.

MONOCOUPE: 125 h.p.; only 275 total hours, 50 hours since complete overhaul. Never cracked up, always privately owned. Equipped with ring and racing landing gear, heater for winter. Truly excellent condition throughout. Price, $2,650. Located Hangar 7, Roosevelt Field. No agents. AERO DIGEST, Box 1858.

WARNER STINSON: 4-place. 700 hours, 200 hours since recovered. Excellent condition. Licensed until June 1, 1935. 180 hours since top overhaul. $850. Kenneth V. Nisun, 2436 11th Ave. So., Minneapolis, Minnesota.

CHALLENGER FLEDGLING: Licensed to October 15th, $580. Curtiss Junior; new covering, late type motor, just licensed, $495. Eastman amphibion, Challenger motor with 100 hours total time, $2,000. Write or wire Aviation Associates, Inc., Curtiss-Airport, E. St. Louis, Ill.

WACO F: 125 Kinner; just top overhauled; licensed to July 1935. Silver and vermilion. $1,500. WASP JR. STINSON: 4-place, excellent condition throughout; privately owned, $3,500. Airview Flying Service, Red Bank, New Jersey.

FOUR USED SHIPS in excellent condition: Great Lakes, completely recovered, new engine. J-5 Fledgling, equipped for and complete with hanner towing equipment. J6-5 Challenger, completely recovered and majored. J6-9 Keystone Commuter amphihion, 35 hours total time. For further information or inspection: Basil Aviation Co., Phila. Municipal Airport, Philadelphia, Pennsylvania.

FOR SALE: Waco F, 125 Kinner. Ship painted white, scalloped hlack nose and tail; metal prop, starter; excellent condition; new paint joh July 1934; $1,800 cash. Four cvlinders. pistons and set wiring, crankcase for Cirrus 90 motor, $40. J. C. Cox, Charlotte, North Carolina.

FOR SALE: Travel Air 10-D four-place cahin, Wright J6-7; steel prop, hrakes; excellent condition. Licensed to May 1935. Canaan Airport Co., Inc., Canaan, Connecticut.

WACO 10: Excellent condition, licensed April '35; motor 5 hours since major overhaul; new prop, duals, always hangared, $475. Ludvig Tweten, Box 1293; Minot, North Dakota.

EAGLEROCK OX-5: Comhination wing; perfect condition throughout; just heen relicensed to August 1935; steel propeller, new tires and wheels. $300. AERO DIGEST, Box 1852.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

PITCAIRN AUTOGIRO PCA-2: Modernized Wright F 300 h.p., total time 250 hours; 20 hours since major overhaul. Also complete sign-towing equipment, including 150 interchangeahle letters, etc. AERO DIGEST, Box 1850.

FINEST J6-7 STANDARD in the State. Air wheels, navigation lights. Just relicensed. $2,000 casb. Apply AERO DIGEST, Box 1851.

WACO J-5: 3 POLB, excellent condition; new tires, recovered, 375 hours. Vernon F. Leesch, 323 E. Arcadia Street, Peoria, Illinois.

FOR QUICK SALE: Identified Arrow Sport trainer. Needs lower wing and empennage recovered to relicense, tbough good for two years as is. LeBlond 60, in good condition at 400 hours total. This job worth $600; going for $350 cash. Will fly it anywbere. Phil Browning, Port Huron, Michigan.

TAYLOR CUB: Licensed till Septemher 1935. Perfect condition, special paint job, safe and economical; never damaged, always hangared, like new; $650. Ossie Resch, Youngstown, Ohio.

$425 FOR A MIGHTY FINE Swallow with new OX-5, new prop, practically new covering on wings. Just relicensed. Details for stamp. Raymond Hegy, Loyal, Wisconsin.

TAPER WING WACO: J-5 Wright, navigation light, compass, starter, speed ring, motor 200 hours since major, 25 hours since ship completely recovered; never cracked up. Price, $1,500. Descomb, 100 Church St., Wethersfield, Conn.

VELIE MONOCOUPE in A-1 condition. 32 foot wing span; split landing gear, never cracked, $400. Terms cash. Ervin Boldt, Route 1, Norfolk, Nebraska.

AERONCA SEAPLANE C-2: Single place De-Luxe. Total time, 50 bours. Landing gear and new Aircraft Products pontoons. Norwood Aircraft Sales, Apt. 4, 2120 Maple Avenue, Norwood, Obio.

FOR SALE OR TRADE: Modernized 125 h.p. Warner powered, three-place Command-Aire. Ship and motor in excellent condition. 50 hours since complete overhaul. Vic Lindemann, 3815 Cleveland Avenue, Brookfield, Illinois.

TAYLOR CUB: New type Continental A-40-2 engine; licensed. Total 71 hours. Cost $1,470. Sbip only 7 weeks old. Buying larger equipment, $1,000 cash flyaway Winchester. Valley Airways, Inc., Winchester, Virginia.

J-5 STEARMAN: Perfect condition, performance and appearance. Goodyear Airwheels. Landing lights. Westport radio and intercommunicating cockpit phones. Rate of climb, bank and turn, clock, etc. Just recovered and beautifully upholstered in red morocco leather. Engine, total hours, 285. Best looking and performing J-5 Stearman have ever seen. Privately owned. Can he seen at Boston Airport. W. M. Packer, care Corinthian Yacht Club, Marblehead, Massachusetts.

FOR SALE: Waco 10, OX-5; Hamilton steel propeller, wings uncovered, $250 cash. Harold Kaiser, 2410 Carmel Avenue, Racine, Wisconsin.

SPARTAN 3-POLB: Wright; new type supercharged J6-5 175 h.p. motor. Sbip looks like new. Total time, 175 hours. Sold new from factory Octoher 1932. Hamilton Standard steel propeller, Eclipse hand inertia starter, Engel speed ring, lights latest type. Privately owned, always hangared; licensed to February 1935. Price $950. Soper Bros., Lawton, Oklahoma.

CURTISS ROBIN: Late type 185 h.p. Challenger motor, recovered and re-licensed last May; Curtiss-Reed steel propeller, 300 hours, standard instruments, $950. R. G. Schmitt, 2914 Washington, St. Louis. Missouri.

HENDERSON: Heath-factory converted, new rings, pistons, pins. Zero time in air. Complete with carburetor, magneto. $95 cash F.O.B. Richard F. Smith, Y.M.C.A., Beverly, Massachusetts.

FOR SALE: Licensed 3-place OXX-6 Travel Air, witb metal prop; price $350. H. J. Larkin, 206 Corey Road, Boston 47, Massachusetts.

OX-5 ROBIN: Licensed until March 1935. 18 hours since complete motor and empennage overhaul. Never cracked. Pioneer instruments. Hangared. $475 cash. Ben Scott, Ardmore, Oklahoma.

J-5 RYAN BROUGHAM: Excellent condition, just relicensed; 7 hours since complete overhaul on motor. Bargain at $1,150. Will accept small plane as part payment. Cartbage Airways, Cartbage, Missouri.

TRAVEL AIR OX: Miller overhead, Miller pistons, new covering, Stearman vermilion and white, chrome struts; DH wheels, new prop, fastest OX in tbe country. $600. AIRPLANES RECOVERED for as low as $200. Time payments arranged. Write us for estimates on your ship. Work and materials guaranteed. Gary Airport, Gary, Indiana.

FOR IMMEDIATE SALE or exchange; 12 certified airplanes, as follows: J6-9 330 h.p. 6-place Stinson cabin ship; 1 J-5 B-1 5-place Ryan, excellent condition; J6-5 175 h.p. 3-place Curtiss Robin Cabin ship; J-5 Waco Seaplane, fully equipped with Edo floats and Heywood air starter, condition like new throughout; J-5 3-place Travel Air, late type; Lycoming-powered Stinson Junior; J6-9 330 h.p. Straight Wing Waco; J-5 Waco; J6-7 250 h.p. Straight Wing Waco; OX-5 Waco 90; Wright Cyclone-powered 20-passenger Patrician. All ships in excellent condition throughout. Pbotographs furnished if you mean business. Will accept good late model cars on deals. Terms to responsible buyers. Becker-Forner Flying Service, Inc., Jackson, Michigan.

FOR SALE OR TRADE: Warner Lincoln trainer, just major overhauled; time 250 hours. Travel Air 2000, good condition, D-H wheels. Walter Beeler, Huron, South Dakota.

FAIRCHILD 22's: 3 of them; Cirrus inverted motors, one hrand new. One FLEET, model 9; wheel pants, starter, special instruments; like brand new. SZEKELY BULL PUP. These ships must he seen to he fully appreciated. Jack Byrne Flying Service, Central Airport, Camden, New Jersey.

CURTISS JUNIOR: 45 h.p.; completely recovered, wing and structure strengthened; always hangared; total time 125 hours; licensed July 1935. Free instruction. $500. Franklin Pyle, Brandywine Summit, Pennsylvania.

$395 TAKES late model 90 h.p. LeBlond engine, slightly used, with new propeller. C. F. Keen Mfg. Co., 2121 Oakridge Avenue, Madison, Wisconsin.

VELIE MONOCOUPE: New covering, finish red and silver. Engine just overhauled. Will trade or take late model light car. Norman Kramer, Syracuse, Kansas.

DRIGGS SKYLARK: Inverted Rover motor. Licensed to June 1935. Semi-air wheels. Instruments in both cockpits. Excellent condition. Will sacrifice for cash. S. H. Leslie, Pikesville, Kentucky.

STINSON, JR.: with Wasp Junior, cruising 120, blind flying instruments, drift indicator, landing lights, airwheels, speed ring, excellent condition. B. C. Skinner, Dunedin, Florida.

SPECIAL CHURCH: Factory welded fuselage assembled hy expert mechanic, complete less motor in Indiana. Will sell regardless of price. Bechair, 29 N. Meredith, Pasadena, California.

WACO OX-5: Licensed, excellent condition, engine recently overhauled; new rings and magneto, new prop, recovered last year. Priced at $495. Roland S. Esch, New London, Ohio.

AERONCA C-2: Less than 200 hours. Always stored in hangar. Excellent condition. New cylinder assemhlies. Just relicensed. $450. Harold F. Culp, Orange City, Florida.

CHALLENGER ROBIN: Complete with floats, wheels, siren, navigation lights, adjustable prop. Sbip and motor perfect. No reasonahle offer refused. Will trade. C. W. Siehl, Sberhurn, Minnesota.

D. H. MOTH: Metal propeller, aluminum gas tank, bank and turn, etc. NC licensed, A-1 condition, $700. D. Crossman, Stafford Springs, Connecticut.

$50 BUYS Clipped Wing OX-5 Standard, good flying condition, fuselage recovered. Ship at Jamestown, N. D. Western Airplane Distributors, 602 Graphic Arts Bldg., Kansas City, Mo.

TRAVEL AIR 6-place joh with J6-9 330 motor. Excellent condition throughout. Direct drive starter, landing lights, lavatory. $1,500 casb or trade. William Farly, Albany Airport, Alhany, New York.

WACO C: Less than 50 hours. Must sell. Landing lights, flares, bonded for radio, bank and turn, rate of climb, pants, steel prop, special paint and upholstery, color dark hlue. Price $5,500. AERO DIGEST, Box 1854.

CHALLENGER ENGINE: Rehuilt; steel prop, motor mount and cowling for Eaglerock, $485. Write for prices new Eaglerocks and Flyabouts. Expert repair work all types. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

FOR SALE OR TRADE: 1 Pitcairn PA-6; 1 Avro Avian. 1 B-5 J6-9 Ryan. Other airplanes available. Deemer Aircraft Sales Company, Brookville, Pennsylvania.

$200 BUYS HALF INTEREST in OXX-6 Eaglerock. Just relicensed. Good ship to build up time. Cliff Clendenin, Jamaica Sea Airport, South Jamaica, L. I., New York.

GIPSY MOTH: Completely rebuilt, new wings, uncovered and unlicensed, motor excellent. $400, includes drum of Glidden's nitrate dope. Diamond Airport, Box 195, San Antonio, Texas.

FAIRCHILD 42: 4-place cahin. Total time 185 hours. $1,400. Dual stick control, Wright Whirlwind J-6 330 h.p. Equipped with R C A radio, shielded and honded; electric Eclipse starter and generator, hrakes, air tires, landing lights, Pioneer turn and hank and rate of climb, large baggage compartment. Top speed 130, cruises at 109 at 1700 r.p.m. Tbe ship is like new throughout. Prohinsie, 209-30 Northern Boulevard, Bayside, L. I., N. Y. Telephone Bayside 9-7600.

OX ROBIN for sale: Licensed to 1935. Ship in excellent condition. Scintilla mag, compass, booster, etc. High compression pistons and Miller overhead. $425. Mantel, Jamaica Sea Airport, Rockaway Boulevard, Jamaica, N. Y.

AERONCA SEAPLANE C-3: Two-place. Corrosion proofed for salt water. Total time, 350 hours. Motor just factory overhauled. New Edo pontoons. Also has oleo landing gear and winter enclosure. Norwood Aircraft Sales, Apt. 4, 2120 Maple Avenue, Norwood, Ohio.

TAPERWING WACO: J6-7 with clutch; red and cream; fairings; front cockpit cover; lights, generator, duals; licensed June 1935. Condition perfect, value over $2,000; extra instruments; a steal at $1,550 cash, flyaway New York; private. AERO DIGEST, Box 1855.

FOR SALE: Barling NB-3, LeBlond-powered, near Akron. 213 hours, total time; in good sbape, always hangared; air wheels. $450. AERO DIGEST, Box 1856.

MONOCOUPE: Rubber mounted Velie; air wheels, brakes, airspeed, bank indicator, navigation lights, clock, etc. Licensed December 15, 1934. 320 bours total time. No time since major. $850 cash. Ben B. Dowell, Jr. Paulding, Obio.

TRAVEL AIR: 6-place cabin; J-6 330 h.p.; anti-drag ring; excellent condition. Engine just overhauled, new rings, valve guides and all parts showing wear. Supercharger modernized with clutch. 542 hours total time; never cracked. Licensed till December. $2,750. FRANKLIN 90 Lambert: 270 hours total time; 20 hours since major overhaul. New rings, valve guides and all parts showing wear. Licensed till June 1935. One of the best training ships ever built. Never cracked. $1,350. Clare Richmond, Montpelier, Ohio.

FOR SALE: Stinson trimotor Model T Airliner, fully equipped. Complete information available upon request. John T. Corrodi, Inc., Box 185, Bexley Station, Columhus, Ohio.

WACO F-2: Continental; like new. Flares, lights, pants, electric starter, steel propeller. Will accept Waco F part payment. Paul Peterson, 2503 Union Avenue, Altoona, Pennsylvania.

6-PLACE STINSON: J-5 motor; licensed till June 1935. 60 hours since major, 360 hours total, excellent condition. Make offer; trades considered. Florida Skyways, Miami, Florida.

FOR SALE: LeBlond 65 Arrow Sport. Relicensed to Sept. 1, 1935. Good condition. $500 cash. Harlan Rahilly, 208 W. College St., Austin, Minnesota.

BIRD: Kinner K-5 late type, steel propeller, brakes, air speed, booster; nice finish; motor overbauled, in fine condition. $1,250 for quick sale. Fred McKenrick, Ebensburg, Pennsylvania.

LICENSED CURTISS JUNIOR: Time on ship 350 hours, engine 50 hours since factory recondition. Location Southern Minnesota. Bargain at $300. AERO DIGEST, Box 1863.

STINSON R-2: Looks and runs like new; 240 b.p. Lycoming; red and blue paint job, red leather upholstery; total time 585 hours, time on motor since major overhaul, 58 hours. Extra equipment: 73 gallon gas capacity tanks, retractable landing lights, 5 electric flares, Lear radio, rate of climb, bank and turn, thermocouple, ice warning indicator, clock and blind flying bood; licensed to July 15, 1935. Priced at $2,950 cash. Located at Elmburst Airport, Elmhurst, Ill. Will send anywhere for inspection upon a reasonable deposit and pilot's expenses. Address E. E. Brazelton, 200 S. Kenilworth Ave., Elmhurst, Illinois.

FOR SALE: Warner Command-Aire, excellent condition, licensed. Duals, steel propeller, many spare Warner parts including cylinders, master-rod assembly, etc. $825 complete. Rafus Flying Service, Greenshoro, Nortb Carolina.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

PITCAIRN, J-5: Sport Mailwing PA-7; brand new; international orange wings with hlue fuselage. Licensed. $3,000 Cash. Silver Star Airport, Langhorne, Pennsylvania.

FOR SALE: Ryan B-5, 330 h.p., steel propeller, flares, landing lights, turn and bank and compass; excellent shape throughout; licensed until July 1935. Ship and motor time under 700 hours. No time on motor since complete overhaul. Bargain price for cash, $2,150. AERO DIGEST. Box 1859.

FOR SALE: Warner Fleet, 125 h.p., air wheels, steel propeller, motor perfect; no time on ship since recover; special hand-ruhhed finish, gold wings, intense black fuselage with chrome stripe; perfect shape throughout and licensed for a year. Excellent huy at $1,550. AERO DIGEST, Box 1860.

WACO 125: In splendid condition, licensed until May 1935. Siemens motor, 160 hours. Overhauled 30 hours hack. Wings recently recovered, total 475 hours. Relicensed and a honey to fly, price $875. How will you trade? Sell Motor Company, 566 Vine Street, Johnstown, Pennsylvania.

WACO J-5: Straightwing; completely rehuilt; Challenger Rohin; Aeronca C-2; several other land and water johs. Chuck O'Connor, Barres Air Service Co., Westfield, Mass.

CURTISS-WRIGHT JR.: Very few hours. New paint, motor, prop, control wires; fine condition. OX Swallow like new, motor 50 hours. Best offers take them. H. O. Storms, Muscoda, Wisconsin.

LATEST MODEL Great Lakes Trainer: Excellent condition, Goodyear Airwheels, brakes, compass, airspeed. Total time, 212 hours. $1,150. Jack Thomas, 1568 Cherokee Road, Louisville, Kentucky.

TWO CURTISS D-12 Motors in A-1 condition. $150 each. Rising Sun Motors, H and Luzerne Streets, Philadelphia, Pennsylvania.

SELL OR TRADE: Avro Avian, Mark III engine, spare parts; licensed; price $550. Trade on larger ship. Thomas Metcalf, Transcontinental Airport, Toledo, Ohio.

BIRD 4-place open biplane; Kinner B-5 125 h.p., for sale hy original owner. Purchased 1932, privately owned, excellent condition, licensed until April 15, 1935. Actual time 368 hours; recent major overhaul. Dual controls, complete set instruments, Hamilton Steel propeller, hrakes, navigation lights, speed rings, wing fairing, exhaust ring, metal cockpit cover, Heywood starter. $1,850. A. L. Bernardin, P. O. Box 328, Evansville, Indiana.

TRAVEL AIR 6000 monoplane: Completely recovered and refinished. J-6 330 h.p. engine, steel propeller, retractable landing lights, other extras. Ship perfect, engine good. Price $1,450. Trades accepted. AERO DIGEST, Box 1861.

LOCKHEED SIRIUS: With Wasp C; entire ship and motor just major overhauled. Ship painted all white, with red and gold stripes. Equipped with hlind flying instruments, electric starter, landing lights, wheel pants and sliding windshield. Total time on motor. 325 hours; ship, 200 hours. Price $5.000. Will accept smaller ship in trade. Andy Stinis, Floyd Bennett Field, Brooklvn. N. Y.

FOR SALE: J6-9 330 h.p. 6-place Stinson cahin ship. Excellent condition throughout. No reasonahle offer or proposition refused. Terms to responsihle huyers. Micbigan Aero Motors, Jackson, Michigan.

LATE TYPE Velie Monocoupe. Recovered, majored, licensed. 16 hours. $650. Jos. J. McGranaghan, 109 S. 59th Ave., W., Duluth, Minn.

WRIGHT J6 300 engine, total time approximately 300 hours; engine has not heen run since return from the Wright factory where it was overhauled. Make us a cash offer. Waco Aircraft Co., Troy, Ohio.

4 PLACE MONOCOACH: Perfect condition. J5 engine, complete night equipment. Will sell or trade for Monocoupe Lambert or Warner. W. M. Hutchins, Curtiss-Steinherg Port, E. St. Louis, Illinois.

STINSON JR. "S": Lycoming powered. Ship and motor in perfect condition. 180 hrs. since major overhaul. Equipment: Landing lights, flares, duals, rate of climh, turn and hank, 8 day clock. Always hangared. $2,250. Tommy Metcalf, Transcontinental Airport, Toledo, Ohio.

FOR SALE: Bellanca Model CH-300, 6 PCLM J-6, 300. Dual controls. Standard instruments and accessories. Plane time 620 hours. Engine time since overhaul 110 hours. Price complete $2,350. If you have J-5 or J-6 engine make offer on airplane. Bellanca Aircraft Corp., New Castle, Delaware.

FOR SALE: Pitcairn Autogiro, majored Kinner B-5, excellent condition, $2,350. Waco 3 POLB, 210 Continental, 150 hours, real hargain, $3,150. One 165 Continental, second series, completely overhauled, two first series, sale or exchange. Our engine parts are reasonahle and thoroughly reconditioned. Wanted: J5, Warner, Lycoming engines. AERO DIGEST, Box 1864.

WARNER WACO D; 300 hours; hank and turn, rate of climb, steel prop, front cockpit cover, ring. $1,800 cash. L. Wilkinson, Llewellyn Park, Orange, New Jersey.

AMERICAN EAGLE: Biplane. New type Kinner 5 motor; total flying 5 hours. Always hangared. NC licensed. Like new in every particular. Never cracked. Consider trade for car. T. P. Marks, Inc., El Dorado, Arkansas.

WACO F: 125 Kinner B-5; 276 total hours, 40 hours since top; like new, $1,475. Always bangared; privately owned. Reinauer Bros. Motor Company, 25 West 9th Street, Oklahoma City, Oklahoma.

KINNER STINSON: 3-place, licensed. Motor heing overhauled. Can he licensed for 4-place with Warner motor. Cheap for casb or will give cash difference on 4-place ship. OX Lincoln Page: flyaway $150. Have cash for good 32-foot Velie Coupe. State lowest price and condition. Emmett Staoleton. Devils Lake, North Dakota.

CURTISS JUNIOR: Brand new condition, specially reinforced throughout, 154 hours, $425 cash. Consider trade on larger crackup. John Papay, 2032 West 48th St., Cleveland, Ohio.

100 AIRPLANES: $80 up, flyaway. Repairable crackups, $30 up. Send 20c for complete list with owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

FAIRCHILD 22 (Rover): Total time 430 bours; 120 hours since major overhaul; $1,100. Also have on hand large supply of OX-5 Challenger and Waco 10 parts. Flying Dutchman Air Service, Somerton Airport, Somerton, Pennsylvania.

STEARMAN, J-5 MOTOR: Total time, 400 hours. Motor has 35 hours since major overhaul. Entire ship recovered recently. Special gloss Stinson finish. Has ring on motor and large semi-air wheels with brakes. Price $1,400. Waco Straight Wing with J6-5. Motor completely modernized. Total time, 375 hours. Ship just recovered and painted, white fuselage and red wings. Price $1,500. Fleet with 90 Kinner: Motor and ship in excellent condition; just relicensed; total time 550 hours. Price $1,275. Will consider trade on any of these shios. Andy Stinis. Floyd Bennett Field. Brooklyn, New York.

KINNER SPORTSTER: LWOM. New August, 1933; 175 hours total. New K-5 motor, 81 hours; always hangared, like new. Reason for selling, husiness in Europe. Photographs on request. Cash price, flyaway Niagara Falls Airport, $1,750; cost new $2,895. Bartlett, Niagara Falls Airport, New York.

BARGAINS: Curtiss-Wright Jr., just relicensed, $350. J-5 Mailwing, flares, radio, airwheels, $1,175. J-5 Travel Air, $1,100. Lamhert-powered Franklin trainer, $775. Warner Aristocrat, $975 or will trade for small open ship. Stinson left wing and parts. OX parts. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

FOR SALE OR TRADE: P2 Privateer Amphihion; total 220 hours. Licensed Septemher, 1935; completely rehuilt; $1,400. AERO DIGEST, Box 1865.

J-5 SPEEDWING Travel Air: 450 hours, engine top overhauled, hrakes, speed ring, complete hlind flying instruments. Hamilton Steel propeller. Licensed until February, 1935. Price $1,000. Curtiss-Wright Jr., 300 hours, good condition, just relicensed, $300. Air Activities Airport, West Chicago, Illinois.

AMERICAN EAGLE: High compression OX-5. Complete overhaul. New tires and tuhes. Fuselage recovered. Landing and navigation lights. Licensed to September, 1935. $400 cash. Paul H. Stamhaugh, 222 North Seminary St., Galesburg, Illinois.

SALE OR TRADE: Waco F Warner, licensed to August 1, 1935. Fine condition. Waco 10, OX-5: Licensed, good condition. WANTED: Waco F-2, 210 or 165; Waco C, Monocoupe, J-5 three-place ship. Pay difference. Lloyd Pierce, 2629 Fox Avenue, Fort Wayne, Indiana.

FOR SALE: Waco Taper Wing J-5, relicensed August first; excellent condition throughout, 15 hours since major; equipped with hlind flight instruments, navigation lights, speed ring, front cockpit cover; 550 hours total, ship and engine. Always privately owned and flown, never cracked. Price $1,500. AERO DIGEST, Box 1869.

$185 DOWN, halance $27.50 per montb huys recovered Waco 10 with 1935 license, DH wheels. Inspection by appointment only. Pioneer Aviation Co.. Airoort. Svracuse, N. Y.

BELLANCA SKYROCKET, Warner Fairchild 22, Cirrus Fairchild 22, Warner Fairchild 22 seaplane, Warner Fairchild 24, Fleet, Bird, Fokker Super-Universal, Lockheed Vega, Lockheed Sirius, Wasp Laird, Warner and Lamhert Monocoupes, Stinson Jr., Stinson Reliant, Travel Air 6000, Stearman J6-7, Waco C, Great Lakes, Travel Air Sedan, J6-9 Laird cracked up, Stinson U Trimotor. Aircraft Sales Company, Hangar D. Roosevelt Field, Mineola, New York.

SELL OR TRADE: Savoia-Marchetti S-56. Ship completely rehuilt and relicensed until July, 1935. Many extras, including special landing gear with semi-airwheels. Paul Lonquich, 12 Holland Avenue, Yonkers. New York.

FOR SALE: Curtiss Junior, just relicensed and in excellent condition. Best offer or will trade as part payment on three-place plane. D. Whitworth, 182 Conover Ave., Nutley, N. J.

FOR SALE: 3 Loening Amphihions in good condition and licensed. Also aircraft and engine parts. Write or wire Pennsylvania Airlines and Transport Company, Pittshurgh, Penna., for further information.

J-5 FIVE-PLACE BUHL: Heywood starter, steel prop; licensed until June, 1935. Excellent shape; 50 hours on motor since factory overhaul. $900 cash at Revere, Mass. Dolly Bernson, Atlantic Airways, Inc., Muller Field, Revere, Mass.

$885: J-5 RYAN or J-5 Fairchild cahin, hoth in perfect condition. Ryan has heen recovered. Terms, $500 down, balance monthly. Pioneer Aviation Co., Airoort. Svracuse. N. Y.

WACO CABIN: Late 1932, with 210 Continental; total ship time 385 hours, total motor time 123 hours; equipped with radio, hank and turn, rate of climb, clock, steel propeller, etc. Wings Corporation of Philadelphia, Blue Bell, Pennsylvania.

WACO J6-7: Specially huilt for Ford Tour; placed second. Total time 385 hours, 10 hours since factory majored; special streamlining; fully equipped; airwheels, 80 gallons gas. 120 cruising. Beechcraft Hangar, Roosevelt Field, Mineola, New York.

NB-8 GENET: Good condition, $550. Eligihle for license. Trade for 1934 auto. Perry Markley, McCune, Kansas.

TRAVEL AIR 4000: J-5 motor. Excellent condition throughout. Licensed; little time since major overhaul, including fuselage recovered. Roger Pennock, 501 Cooper St., Camden, N. J.

CHALLENGER OX-5: Excellent sbape. Need different type ship, will trade. Also low pressure tires and tuhes at bargain. Capitol Airport, Bladenshurg, Maryland.

5-PLACE FAIRCHILD cahin FC-2: Total time 250 hours, 50 hours on motor since factory overhaul; duals; camera trap doors; tail wheel; equipped for hlind and nigbt flying. Ideal for ohotographic work. $1.050. Stewart Sales and Service, 933 Franklin Avenue, Brooklyn, N. Y.

ARROW SPORT: 65 LeBlond; 200 hours. Ship painted cream color with hlack stripe. Licensed until June, 1935. $500 cash. Privately owned, never cracked. Atlantic Airways, Inc., Revere, Massachusetts.

$395: LICENSED VELIE Monocoupe, perfect condition, dual controls, motor major overhaul June 15. 1935. OXX-6 Travel Air, $475. Cballenger Rohin, $900. Pioneer Aviation, Airport, Syracuse, N. Y.

WARNER MONOCOUPE 125: Total hours 230; privately owned; excellent condition; licensed July, 1935. Special instruments plus radio, heater, etc., $1,500. J. E. Packard, 633 Frances Building, Sioux City, Iowa.

KINNER K-5 AMERICAN EAGLE: Model 201. Instruments, motor and plane in perfect condition. Navigation lights, air wheels; licensed to July, '35. $800. Archie MacDougall, Pembina, North Dakota.

VIKING FLYING BOAT: 4-place, licensed July '35; consider good land joh or late model car as part payment. G. A. Beckett, 431 Maine Ave., Atlantic City, N. J.

PLANES AND ENGINES FOR SALE

STINSON LYCOMING: Blind and night flying instruments. New airwheels, tail wheel. Covering perfect and new finish in hlack trimmed with red. New red leather unholstering. No time on engine since overhaul; $1,500. TRAVEL AIR 4000 Speed Wing, J-5. Steel propeller, spinner, speed ring, semi-airwheels and hrakes. Covering perfect, newly finished in white and red. No time on engine since overhaul; $1,350. Aero-Wavs, Inc., Cleveland Airport, Cleveland, Ohio.

CESSNA WARNER: Just overhauled completely; recovered; steel prop; flares; lights; $1,500. Will pay honus to exchange Hamilton Standard prop approved 110 horsepower, just reconditioned, for one rated 125. Vanhenschoten, Bowman Field, Louisville, Kentucky.

CHALLENGER ROBIN: Heywood starter, full instruments, always hangared. Major overhaul. Recently recovered. Sell or trade for five-place cahin. Aereco Flying Service, Fort Wayne, Indiana.

AMERICAN EAGLE A-129: Kinner K-5 motor. Both lower wings damaged. Can he rehuilt cheap. Otherwise perfect. Ship just relicensed before mishap. May he seen at Mayer Field, Bridgeville, Penna. $500. Irving 24-foot seat pack chute, excellent, $75. Both must he sold this month. E. S. Stickel, Fincastle, Virginia.

$175 DOWN huys Curtiss Junior; halance on terms. Junior just licensed, in perfect condition. First deposit received gets preference. Pioneer Aviation Company, Airport, Syracuse, New York.

WACO F-2: 165 Continental; ship and motor time 400 hours, motor just completely overhauled; hank and turn, rate of climh, special paint joh, wheel pants, engine cowl, remote control fire-extinguisher system and other special features. Privately owned and in wonderful condition. Wings Corporation of Philadelphia, Blue Bell, Pennsylvania.

SALE OR TRADE on ship or cars: Triad Trimotor, 4PCLM; 3 LeBlond 65's, factory overhauled, 242 hours total, recovered, licensed till June, 1935. Cliff Frazier, 308 So. 11 Street, Lincoln, Nehraska.

MISCELLANEOUS PRODUCTS AND EQUIPMENT

"IF IT FLIES WE HAVE IT." Two R-1820-F Cyclone motors, all or any part; make offer. Standard steel propellers, $50 to $150. Tires from 24 x 4 to 48 x 12, $3 to $10. 14 x 3, 20 x 4 and other size wheels from $2 to $3.50. Used OX-5 motors, $25 and $35. New and used Hisso motors, $75 to $100. B. G. and Mosler spark plugs, 50c. Airplane dope, $1 gallon. Wasp and Hornet motors, new and used, from $500 to $1,500. War surplus motors of all kinds, make offer. Crawford Airplane Supply Company, 350 Washington Boulevard, Venice, California.

RACING CAR for sale or trade on car or plane. New hody and chassis in June. Has counterhalanced crankshaft, racing wheels. Ready to race. Complete, $500. Ted Dunkelherger, Miamishurg, Ohio.

WACO 90 OX-5: Perfect condition, 200 hours; no time since top overhaul; Scintilla magneto, new Miller overhead; licensed until June 1935; $550. WACO 10: Less propeller, complete overhaul on motor, price "as is", $200. Practically new Scintilla mag for OX-5, complete, $50. New WACO 90, never set up; complete less engine, landing gear, hoth lower and left upper wings; will sell parts or make offer, "as is". We carry a complete line of OX-5 parts, also complete stock Continental engine parts. Let us estimate your airplane repairs and engine overhauls. Dennison Airport Operating Company, Quincy, Boston, Mass. Department of Commerce Approved Repair Station.

FOR SALE: Wings, tail units, fuselage and engine parts for Moth, Command-Aire and Rohin airplanes. Also Curtiss Jr., just licensed, like new, $395. M. F. Steffen, 370 Humholt, Buffalo, New York.

DE LUXE "30" PACKARD Roadster: Tires and paint new, radio, some additional cash for 2-place Aeronca with winter enclosure. Jack Thomas, 1568 Cherokee Road, Louisville, Ky.

LYCOMING engine parts, used less than 100 hours, at give-away prices. Write or wire Northern Air Service, Williamson-Johnson Airport, Duluth, Minnesota.

PONTOONS; PROPELLERS; PARTS: Almost new, refinished Edo pontoons for 6-place airplane, $475. J6-5 and Challenger Standard Steel propellers, $75. Reconditioned J-6, J-5 and Challenger parts, 70% off. Florida Skyways, Miami, Florida.

GOOD USED PARTS hought and sold. All reconditioned. OX-5 parts 75% off catalog. Send 3c stamp for list. Aircraft Salvage Shop, Teterhoro Airport, Hashrouck Heights, New Jersey.

PROPELLERS: Lowest prices in the country. Steel props for J-6, J-5. A few hrand new Hamilton wood props at $15. We stock Flottorp, Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

TWO J-5 ENGINES, complete; one just overhauled, other very little time since overhaul. One J-5 Scintilla magneto. One J-5 Hamilton Standard propeller. One Pioneer compass. One Fairchild FC-2 right wing. One Pioneer rate of climh, less hottle (small). One Pioneer rate of climh less hottle (large). $850 for all or will sell separately. E. Pellegatti, Cleveland Airport, Cleveland, Ohio.

DIRECT ELECTRIC STARTERS for J-5, originally cost $400. Our price, $40. Wiley flares, factory reconditioned, like new, $32. Aero Salvage Corp., Jackson Heights, New York.

NOTICE: Ryan owners! We have a large stock of Ryan parts for sale. Also new Wasp-powered B-7 Ryan. Conrad Flying Service, Winona, Minnesota.

FALL BARGAINS: Hartzell wood propeller for Kinner motor, like new, $25. Kinner K-5 front exhaust heads, $5 to $30. 6.50x10 semi-air wheels, with hrakes, $67. Pioneer landing lights, complete, $10. J-5 carhuretor air heater with air maze, $12. Diversie's aluminum cleaner, 11c per pound. Let us fill your needs in Kinner and Warner engine parts. All parts guaranteed excellent condition. Aviation Salvage Company, 6205 South Menard Avenue, Chicago, Illinois.

WING EXCHANGE: Trade your wrecked wings for rehuilt or new ones. We also have spars, rihs and struts. New London Aircraft Co., New London, Ohio.

EDO PONTOONS: Model 3300, with water rudders. Also struts, fittings and extra tail surfaces for 1932 or 1933 Cahin Waco. Excellent condition. Will accept first reasonahle cash offer. W. B. Harding, Holmdel, New Jersey.

GET MY PRICES on speed rings of spun dural, NACA cowling and pants. Pontoons for Heath and other light planes. C. V. Andrews, 315 Fourth Avenue, New York, N. Y.

TWO ROBERT BOSCH magnetos, 5 cylinders, for Kinner K-5, $20 each; 2 Scintilla magnetos for K-5, $20 each. One Standard Steel prop, perfect, $55, for Kinner or Warner. 3 cylinder heads with valves, front exhaust, 16 stud, $15 each. 5 cylinders, $5 each. One Challenger motor, 180 horsepower, condition perfect; 261 hours total time, 40 since majored; new carhuretor, new direct hand cranking starter, Standard Steel prop, $250 or will trade for good J-5 and prop. Finklea Brothers, Leland, Mississippi.

WANTED TO BUY OR TRADE

WANTED: Stinson "S" left wing, less aileron and fuel tank. Give details as to condition and lowest cash price. OR will sell Stinson "S" complete hut less ahove item. Basil Aviation Co., Phila. Municipal Airport, Philadelphia, Pennsylvania.

WANT: Lamhert Monocoupe. Give complete description first letter, serial numher, date manufactured. type landing gear, equipment. Will pay cash for hest hargain. Charles Gaylord, Hamilton, New York.

WILL TRADE: 10 acres of dryland Bliss triumph potatoes for airplane. Must he licensed ship. Harvest time Octoher 1st. Eddie Fleming, Van Tassell, Wyoming.

WANTED: Command-Aire left upper wing. State price and condition. Kay Krarup, 180 Hilton Avenue, Hempstead, L. I., New York.

WANTED: One right upper wing for Waco F. A. Janick, 17208 Ryan Road, Detroit, Michigan.

WILL BUY Warner Fairchild 22 or similar ship, if hargain. Must he tandem seating, 100 h.p. up. All details first letter. FOR SALE: M-5 Monoprep: Air wheels, other extras, fair condition, $500. CURTISS JR.: Unlicensed, nearly new motor, $300. Baumgardner, Fort Stockton, Texas.

WANTED: Ford Trimotors—J6-9E, Wasp and Wasp Junior engines, and new parts for same. All must be in good condition. State cash price and give complete history and details. TACA, Tegucigalpa, Honduras, Central America.

WANTED: 1933 Warner Monocoupe. Have J-5 5-place Buhl and Arrow Sport, hoth licensed until July, 1935 to trade. Atlantic Airways, Revere, Mass.

AERONCA WANTED: 2-place. Must he in East. State hours, condition, equipment, motor type, date manufactured. Will not dicker. State lowest price. Crack-ups considered. Viking Flying Boat Co., New Haven, Connecticut.

WANTED: Best two- or three-place licensed airplane ohtainahle delivered Houston, Texas, for $1,200 cash. Prefer Fairchild or Monocoupe. Send detailed guaranteed description first letter; hours and condition motor and plane; history of repairs, crack-ups, instruments, photo, etc. Homer I. Henderson, 611 Esperson Bldg., Houston, Texas.

WANTED: KR-21 Fairchild taper wing, or Great Lakes. Any condition; give details. Cash or trade: Waco 10, licensed August 1, 1935. Like new. W. Conrad, 11637 Ilene Avenue, Detroit, Michigan.

WILL TRADE licensed Waco OX, excellent condition, for late model sedan or hoat; or make cash offer. Located in Maryland. AERO DIGEST, Box 1867.

HELP WANTED

SALES MANAGER: Leading aeronautical instrument manufacturer desires to engage alert and efficient executive capahle of taking complete charge of sales; and of representing adequately a firm of high standing; travel, if necessary; must he of good stature; thoroughly experienced, preferably with aeronautical engineering hackground. Write full personal data, experience and salary expected; replies treated as strictly confidential. AERO DIGEST, Box 1870.

OPPORTUNITY: Wanted immediately! An energetic young man over 21 years old to manage established airport. Preferahly one who plans to take a transport flying course. A good opportunity for a permanent position. Give references and qualifications in first letter. Conrad Flying Service, Winona, Minnesota.

SALESMEN WANTED: To sell paint brushes as a side line to airplane manufacturers, airport companies and air transportation companies. Liheral commissions. David Linzer & Sons, 10-12 Astor Place, New York, N. Y.

PARACHUTES FOR SALE

PARACHUTES: Approved type. Seat, hack, lap and chest; hought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and halloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Estahlished 1903.

28-FOOT WHITE SILK Irving seat pack. Soft harness and adaptahle for training purposes. Reinforced and in good condition. Carrying hag and spare parts. Best offer over $85 takes it. Repacked. George W. deGrange, Bolling Field, Washington, D. C.

POSITIONS WANTED

YOUNG MAN: 21, private pilot, now employed in retail hardware store since 1928, desires position with a future. Interested in aerial photography, art, advertising, salesmanship and all aeronautical enterprises. References. AERO DIGEST, Box 1853.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

PATENTS: Small ideas may have large commercial possihilities. Write immediately for information on how to proceed and "Record of Invention" form. Delays are dangerous in patent matters. Clarence A. O'Brien, 3144 Adams Building, Washington, D. C.

OPPORTUNITY for four responsihle young men to learn to fly on cahin plane; chance for earning salary and traveling on a very small investment. Act at once. AERO DIGEST, Box 1862.

FOR SALE OR LEASE: Active United States Department of Commerce approved Flying and Ground School. Nationally known and advertised. Recognized as one of the hest aviation schools in this country. In operation over 5 years. Graduated over 300 mechanics and over 600 pilots. Located on a 640-acre airport; over three million population within 75 mile radius. Up-to-date equipment and large enrollment. Information will he sent only to responsihle parties who supply references with their inquiry. Write AERO DIGEST, Box 1866.

YOU CAN USE THIS FAMOUS WEST POINT TEXTBOOK TO OBTAIN THE BASIC TECHNICAL KNOWLEDGE YOU NEED

Simple Aerodynamics and the Airplane

4th Revised Edition by Col. C. C. Carter, U. S. Military Academy, West Point. 595 Pages, 395 Illustrations. **$4.50.**

EVERYWHERE recognized as the outstanding technical book in the aeronautic field, no other book approaches this in popularity or is so widely used. In its preparation Colonel Carter had full access to the publications, records, and reports in the Office of the Chief of the Army Air Corps, the Matériel Division at Wright Field, the Navy's Bureau of Aeronautics, the National Advisory Committee for Aeronautics, etc., etc.

Although originally designed for the aeronautic instruction of the Army's cadets at West Point, more than 100 of the country's leading technical schools, colleges, and flying schools are also using this book as the foundation textbook in their courses in aeronautical engineering. It is so clearly and simply written that many thousands of individuals not connected with any school are using it to secure by home study the basic technical grounding that is so essential for any man who desires to make substantial progress in this growing field. Pilots find it particularly valuable as a means of obtaining a ready comprehension of design factors affecting their planes' performance.

In scope "Simple Aerodynamics and the Airplane" ranges from the explanation of the fundamentals of air flow and the production of lift to the complete airplane, its stability, maneuverability, and performance. In addition there is much material on construction, navigation, and equipment. Of special interest are reproductions of typical reports made by test pilots on new designs.

CONDENSED OUTLINE

The Airfoil: Operation of wind tunnel and balance. Airfoil characteristics. Relation between lift coefficient and speed. Creation of lift. Characteristics of L/D ratio. Center of pressure travel. Effect of variation of airfoil dimensions. Thick airfoils. Distribution of load along chord of airfoil. Lateral center of pressure. Effect of aspect ratio. Use of taper in planform and thickness. Shape of airfoil tips. From model to airplane. Reynolds number and variable density wind tunnel.

Selection of Airfoils: Data and methods for comparing airfoils. Reasons for varying values of gap/chord ratio and stagger. Decalage. Pressure distribution tests. Mean chord of a combination of airfoils. Downwash.

Parasite Resistance: Struts. Wires. Fittings. Wheels. Fuselage. Landing gear. Tail surfaces. Radiators—core, plate, wing. Engine drag. Miscellaneous parts. Interference. Determining equivalent flat-plate area. Retractable chassis.

Prnpeller: Propeller as a group of airfoils. Design procedure. Tests. Three- or four-blade propellers. Selection of propeller design for a given airplane. Controllable and automatic propellers.

Complete Airplane: Four units of complete airplane. Ground speed, air speed, relative wind, angle of attack. Equilibrium in climb, dive. Determining stabilizer setting. Determining ability of elevators to balance airplane. Model tests. Proper position of thrust line, of center of resistance. Condition of balance required.

Shows You How to Solve Problems Like This

A monoplane weighing 1728 lbs. has a wing of Göttingen 398 section, with a 36-ft. span and a 6-ft. chord. What horsepower is required to overcome the drag of the wing if the airplane is flying at an angle of attack for the wing of +10°? At —2° angle of attack?

Stability: Determining dynamic stability and static longitudinal stability. Effect of position of c.g. with respect to wing chord. Lateral and directional stability in flight. Dynamic stability in flight.

Control Surfaces: Differential aileron control. Balanced control surfaces. Frise aileron. Auxillary methods of lateral control. Formulas for control surface design. Special cases of rudder use.

Performance: Horsepower required curve for different altitudes. Landing speed. Best gliding angle. Endurance and range. Corrections for speed and scale effects. Other methods of performance prediction. Characteristics of airplane that affect performance. Official tests.

Dynamic Loads: Accelerations occurring as a result of sudden change in angle of attack. Time histories of power-on and power-off pull-ups at 181 m.p.h.; of right and left barrel rolls and a right spin. Inverted flight. Landing and taking off.

Materials and Construction: Features governing design. Use of wood and metals. Retractable landing gear. Single wheel chassis. Oleo gears. Landing gear. Shock absorbing wheels. Brakes. Tail skid. Skis. Wing, fuselage, tail coverings.

(Fill in, tear out and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,

Dept. M800, 15 East 26th Street, New York.

Send me the books checked below with the privilege of examination before purchase. Within five days after books are received I will return any I do not wish to keep and remit for those I retain at the prices shown plus a few cents for delivery. (We pay delivery on orders accompanied by cash; same return privilege.)

☐ **CARTER, Simple Aerodynamics and the Airplane**..... **$4.50**

☐ **LUSK, Aeronautics**..... **$3.25** ☐ **MOORS, Engine Manual**..... **$4.50**

☐ **JONES, Practical Flying**..... **3.00** ☐ **HARTZ-HALL, Rigging Handbook** **3.50**

Name .....

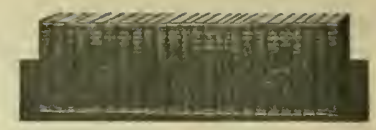
Home Address .....

City .....State* .....

☐ Employed by.
☐ or Reference..... Address.....

(Above line must he filled in unless you send cash)

*If outside continental U. S. and Canada, send cash plus 25c per book for shipping.



You Can Order Any of These Books on 5 Days' Approval

You can order any of the books described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.

Aeronautics

by Hilton F. Lusk, formerly Dean, Boeing School of Aeronautics. 175 illustrations, **$3.25.**

This book offers you a complete ground school course covering all the subjects you need to know to pass the written examinations for a government license as a pilot in any of the grades, including transport pilot, or as a mechanic. 224 test questions like those asked in license examinations help you test your grasp of each subject covered. Gives all needed information on Principles of Flight; Airplane and Autogiro Construction and Operation; Propellers; Engine Construction and Operation; Blind Flying and Engine Instruments; Maps and Piloting; Dead Reckoning; Avigation Instruments and Equipment; Principles and Applications of Meteorology; etc.

Practical Flying

by Major B. Q. Jones, Air Corps, U. S. Army; formerly Chief, Aviation Training, A. E. F. **$3.00.**

Your flight training will cost you less and you will he ready to solo hours quicker if you follow the lessons in this famous pilot's training manual. It will give you basic flying information you would otherwise have to learn by long and costly experience. Taxying, the take-off, the initial climb, emergency landings, straight-away flight, turns, figures-of-eight, glides, landing, cross country flying, stalls and spins, methods of plane inspection, and testing controls and motor are all thoroughly covered.

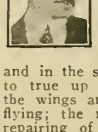
Aircraft Engine Mechanics Manual

by C. J. Moors, Chief Instructor, Department of Mechanics, Air Corps Technical School, U. S. Army. 189 illustrations, **$4.50.**

All needed instructions for servicing or repairing any type of engine and its accessory equipment are given. For each type the manual describes and illustrates by detailed working drawings, diagrams, and photographs—how it is built and how it operates; points of difference and resemblance to other types are carefully pointed out. You are shown just how to locate the cause of any trouble. 38 chapters deal with Elements of Mechanics; Operation, Maintenance and Repair of Specific Engines; Carhureters; Superchargers; Lubricants; Ignition and Electrical Equipment; etc.

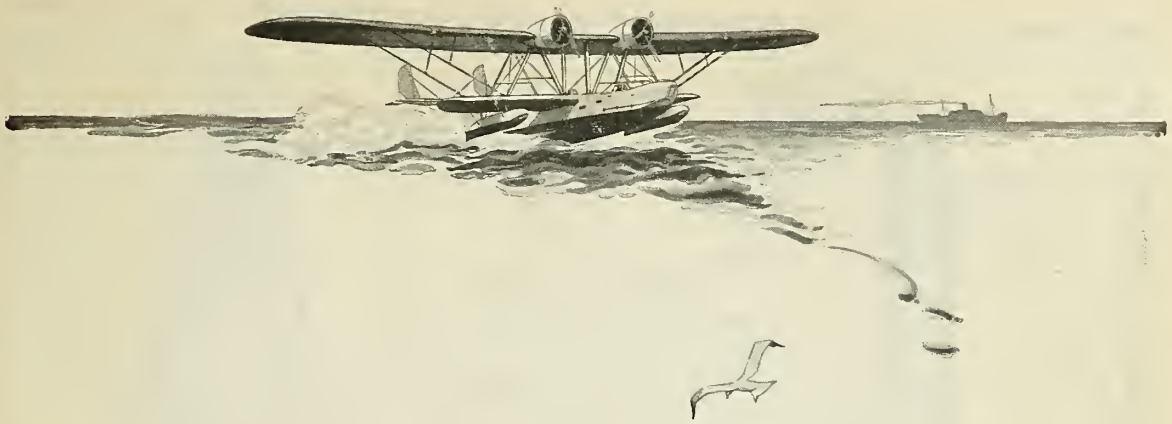
Airplane Mechanics Rigging Handbook

by R. S. Hartz, formerly Lieut. Colonel, Air Corps, U. S. Army; and **Lieut. E. E. Hall,** formerly Editor, "Aircraft Servicing," 104 illustrations, **$3.50.**



This hook tells all about the rigging, maintenance inspection, and repair of airplanes, showing just how to get an airplane into safe flying condition and then keep it that way. The instructions show how each operation should he done, what the proper order is, and the reasons why. Covers fully handling planes on the ground and in the shop; sequence of rigging steps; how to true up the assemhled ship, how to adjust the wings and control surfaces for "hands off" flying; the materials of patching, splicing, and repairing of all kinds; practical hints for riggers; installing and correcting compasses, etc.

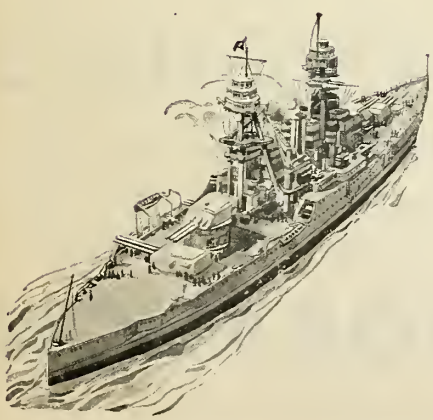
Aero Digest Oct. 1934



Guardians of Our Coast and Commerce

EXTENSIVE coast lines and vast expanses of water are well within the radius of action of the Consolidated Long-Range Patrol Flying Boat. Twenty-four of these aircraft, known as the P2Y type, are serving the United States Navy . . . six of which recently established the world's record for a non-stop over-water mass formation flight of 2408 miles—from San Francisco to Honolulu. Powered by two Wright engines of 700 horsepower each, the Consolidated P2Y patrol plane has a maximum speed of 142 miles an hour and a cruising speed of 115 miles an hour, with an operating range of 3000 miles.

CONSOLIDATED AIRCRAFT CORPORATION
BUFFALO • • • NEW YORK



AERO DIGEST, *October*, 1934
Volume 25. Number 4.

Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3
Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

B. G. Radio Shielded Mica Aviation Spark Plug, Model 4B-2-S

THE CHOICE OF THE AVIATION INDUSTRY

B. G. Regular Mica Aviation Spark Plug, Model 4B-2

B G AGAIN

—as in 1933—

ALL ENGINES

with one exception, participating in the 1934 National Air Races at Cleveland were B. G. equipped.

Contractors to the United States Army and Navy and Aircraft Engine Builders

THE B. G. CORPORATION

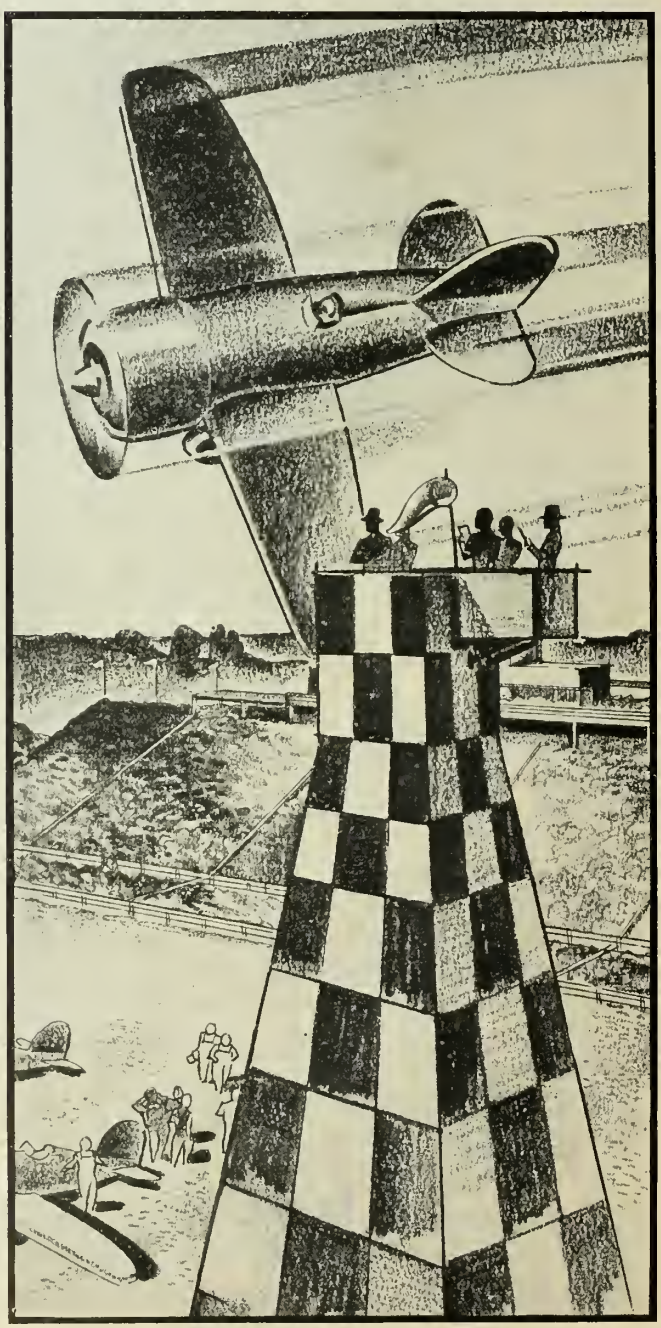
136 WEST 52nd STREET, NEW YORK

Cable Address: Golsteco, New York

In The National Air Races

65 out of 67 WINNERS

roared to Victory with KENDALL, The 30 Hour Oil!



97.01%

Again Kendall Oil outdistances all other oils at the National Air Races! 97.01% of all planes winning prizes this year in the National Air Races at Cleveland, had their speeding motors lubricated with Kendall Oil! No more convincing proof of Kendall's lubricating efficiency could be given than the almost unanimous choice of Kendall Oil by these racing pilots to whom dependable lubrication means so much.

When Doug Davis won the famous Bendix Trophy Race, when he established a new unofficial world's speed record for land planes by tearing through the skies at 306.215 miles per hour, he relied on Kendall, The 30 Hour Oil, to help him triumph . . . just as aviators everywhere have relied on Kendall for years past when they wanted the absolute best in lubrication.

Let Kendall Oil win first place in *your* choice of oils, too. Try it in your engine, and find out about its full-bodied motor protection and economy for yourself. Available at all leading airports in refinery-sealed cans.

KENDALL REFINING COMPANY
BRADFORD, PA.

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL

DO YOU WANT TO FLY A PLANE LIKE THIS?

Lockheed's Electra — the newest twin-engine cross-country transport.

DO YOU WANT TO TAKE CHARGE OF SHOPS LIKE THESE?

TWA Motor and Repair Shops at the Kansas City base, where several Parks graduates are employed.

DO YOU WANT TO BE AN AVIATION EXECUTIVE?

DO you want to achieve success as so many Parks graduates have done and are doing every day?

There is one sure basis for it—*thorough training at Parks Air College!* Whatever course you choose—mechanic's, transport pilot's, aviation executive, or aeronautical engineering—gives you complete practical training plus the educational background which insures advancement as you qualify for greater responsibilities.

The large recent demand for Parks graduates by leading units of the industry grows from that fact. Aviation's head men know what the Parks diploma stands for!

For complete details of Parks Courses and equipment, read "Skyward Ho!"—sent free on request. Use the coupon. Start your career by mailing it now.

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Approved by U. S. Dept. of Commerce

SECTION 10-AD, EAST ST. LOUIS, ILL.

"SKYWARD HO!"

Our 44-page catalogue, completely describing Parks Air College and Parks training, will be sent free on request.

Name.....*Age*.....

Address.....

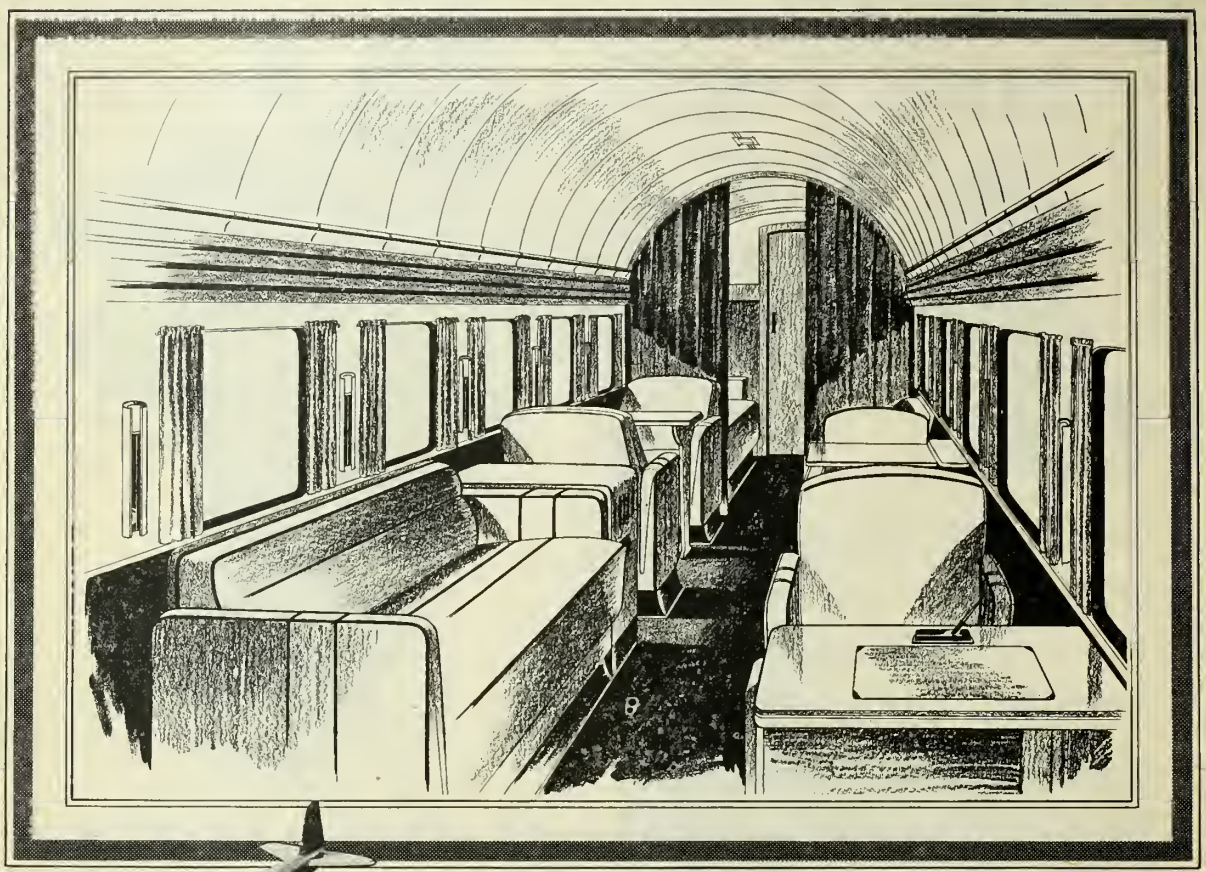
City.....*State*.....

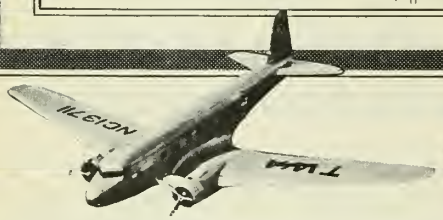
CHECK HERE

the course that interests you:

- ☐ Executive Transport Pilots'
- ☐ A. & E. Master Mechanics'
- ☐ Limited Commercial Pilots'
- ☐ Aeronautical Engineering
- ☐ A. & E. Mechanics'

Adding Luxury to Utility



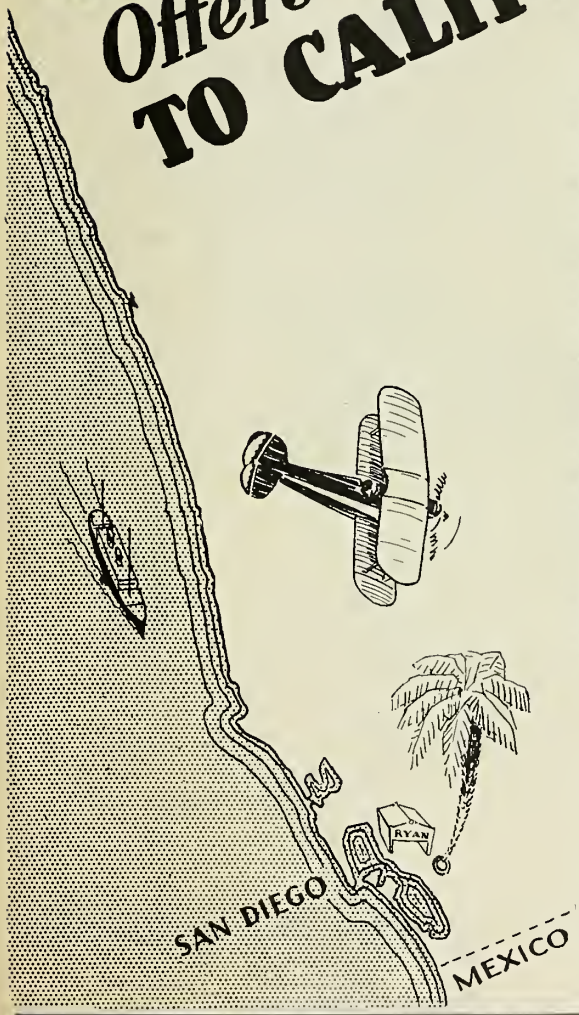


THOSE qualities of safety, speed and quietness which give the Douglas Transport its commanding advantage in air line service, likewise offer a new interpretation for private and business use. ★ Luxury lends itself to the 26-foot Douglas interior while

the 4000-pound payload suggests the utility of the airplane. To these features the Transport adds a speed of 213 m.p.h. Douglas Aircraft Company, Inc., Santa Monica, California.

Douglas Transport

Now RYAN Offers A Free ROUND TRIP TO CALIFORNIA . . . .



THIS OFFER GOOD ONLY UNTIL MIDNIGHT, NOVEMBER 20, 1934!

EACH year the number of winter students at RYAN is increasing. Each year more and more students are realizing that thorough winter training at RYAN, amid the luxury of San Diego's semi-tropical warm days and cloudless blue skies, means uninterrupted flight schedules with lower costs and far better instruction than could be had when hampered by storms, cold weather, and unfavorable winter conditions.

For years, the Ryan School, and particularly the RYAN transport course, has been accepted by the industry as the yardstick of measure for superior instruction—for RYAN training methods appeal to both sportsman pilots and commercial operators as a complete system by which students are trained and graduated as dependable pilots. It is also significant that many pilots who have received early training elsewhere enroll at RYAN for the completion of their transport course.

RYAN TRANSPORT training—with highest Government Approval—gives six months of intensive instruction with primary dual and aerobatics, night flying, cabin ship training and complete ground school. It also includes AT NO EXTRA COST such additional advanced features as blind or instrument flight training, radio beam flying, amphibion or seaplane instruction and 2,500 miles of cross-country experience over the fertile valleys, ocean shore, desert and mountain regions of glorious California.

Until Midnight, November 20, 1934, students who enroll at RYAN for the complete Transport Course will be allowed full credit for FIRST CLASS ROUND TRIP RAILROAD TRANSPORTATION from their homes in the United States to San Diego. This special double transportation offer for winter enrollments at RYAN will not be extended beyond this date. Act now. Classes are now being formed and training can be started immediately.

NOTE: Half-fare refunds are still in effect on Private and Limited Commercial courses. Mail the accompanying coupon today and receive the school's beautifully illustrated and instructive 40-page catalogue with a complete description of *all* RYAN courses.

RYAN SCHOOL OF AERONAUTICS,
Lindbergh Field, San Diego, California

Gentlemen:

I am interested in the courses checked: please send additional information.

☐ Transport Pilot	$1795	☐ Mechanics Course	$175
☐ Limited Commercial	585	☐ WEEMS NAVIGATION Home Study Course	100
☐ Private	585		
☐ Amateur	295	☐ Aircraft Welding	100

☐ Ryan deluxe Combination Course of Transport training plus new Ryan S-T high performance plane $4242

NAME..... AGE.....

ADDRESS .....

CITY..... STATE.....

U.S. DEPT. OF COMMERCE — HIGHEST RATING — TRANSPORT — Approved

RYAN SCHOOL OF AERONAUTICS

Lindbergh Field

In Sunny SAN DIEGO, CALIFORNIA


U.S.NAVY
VERSATILE
★★ An important part of the United States Navy's air equipment—the Grumman Scout and the Grumman Amphibion ★★ The versatility displayed in the performance of these planes is but a reflection of the versatility of the Grumman organization's engineering and production facilities.
GRUMMAN
AIRCRAFT ENGINEERING
CORPORATION
Farmingdale, Long Island, N. Y.

LOVE FIELD

DALLAS AVIATION SCHOOL AND AIR COLLEGE

DALLAS TEXAS

Where you save time, save money, and make good

THEY'RE COMING TO DALLAS

FOR THEIR FLYING TRAINING!

BOYS from half the states in the Union, now in training here, make Love Field actually a national headquarters for flying training. There MUST be a reason—and the reason is this: WE MAKE GOOD OUR PROMISES and YOU MAKE GOOD IN YOUR TRAINING.

Come where everything is on the move—on the go—on the up and up!

- $15,000 machine shop.
- $40,000 stock of parts and supplies.
- Today's flying and training equipment—no old style ships or motors.
- Shops for welding, plating, propellers, motors and aircraft.
- Our students are given every advantage — you GET THINGS DONE here.

THE SHIPS WE OWN

- 5 Fleets
- 1 Stearman
- 1 Stinson Cabin
- 1 Waco Cabin
- 1 7-Place Travel Air "Wasp"
- 1 Fledgling
- 1 Swallow Trainer
- 1 Trimotored Ford

Greatest line-up in U.S.A.

- Love Field—a million dollar airport. One of America's best.
- We have $200,000 in equipment for you.
- Good flying weather all winter — no delays through bad weather.
- We own our own dormitories and cafe—we see that our students get the best for the least money.
- No other school in America offers equal opportunities for its students to observe the actual operation of air mail lines.
- We are closely affiliated with a company that flies 2200 miles of air mail daily.
- Dallas is a live, hustling city of 300,000.
- Bus line from Love Field to city. Fare 10c, half hour schedule.

What we say is so. We never misrepresent. Our graduates are our best boosters.

WHY PAY MORE?

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$ 595
Private Pilots' Course	$ 545
Amateur Pilots' Course	$ 350
Master Mechanics Course	$ 300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five per cent from the above prices for payment in full at time of enrollment.

We are finding employment for our graduates . . . thirty placed in good jobs during the last 90 days. What other school can do this?

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

These special inducements are for you — Now! Write or wire for Catalog and full information.

USE THIS COUPON:

DALLAS AVIATION SCHOOL AND AIR COLLEGE
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

Transport Pilot ☐ Master Pilot ☐
Limited Commercial ☐ Master Mechanic ☐
Private Pilot ☐ Aviation Radio ☐
Complete Radio ☐

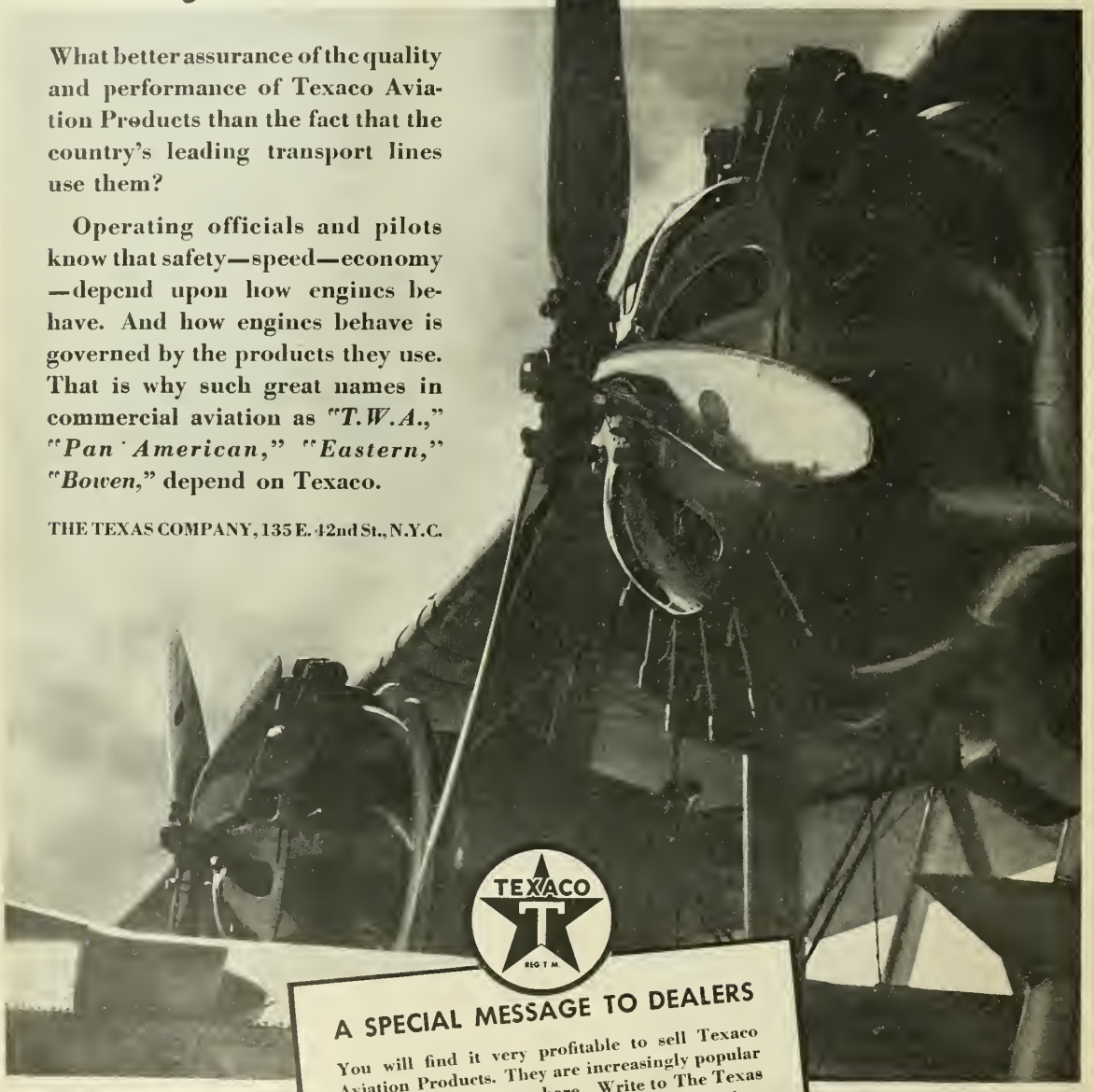
Name.....
Address.....
City.....
State.....

DALLAS

AVIATION SCHOOL AND AIR COLLEGE

LOVE FIELD DALLAS, TEXAS

Famous liners of the air turn to *proved products*



What better assurance of the quality and performance of Texaco Aviation Products than the fact that the country's leading transport lines use them?

Operating officials and pilots know that safety—speed—economy—depend upon how engines behave. And how engines behave is governed by the products they use. That is why such great names in commercial aviation as *"T.W.A.,"* *"Pan American,"* *"Eastern,"* *"Bowen,"* depend on Texaco.

THE TEXAS COMPANY, 135 E. 42nd St., N.Y.C.

TEXACO

REG T M

A SPECIAL MESSAGE TO DEALERS

You will find it very profitable to sell Texaco Aviation Products. They are increasingly popular at aviation fields everywhere. Write to The Texas Company for details on an interesting proposition.

TEXACO

TEXACO AIRPLANE OIL ★ TEXACO AVIATION GASOLINE ★ TEXACO MARFAK GREASE ★ TEXACO ASPHALT PRODUCTS (for runways, hangar floors, aprons and dust laying)

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER FOUR

Contents for October

COVER DESIGN

Seaplane and landplane versions of the Bellanca Bomber powered by two Wright Cyclone F-3 engines of 715 h.p. each

Published monthly by the Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy, 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5.

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

BOSTON: L. Mitchell, 80 Boylston St., Phone Hancock 5066. • CHICAGO: L. F. McClure, 919 No. Michigan Ave., Phone Superior 2802.
DETROIT: W. E. Fellows, 315 Stephenson Bldg., Ph. Madison 9244. • LOS ANGELES: F. E. Samuels, 1129 Mohawk St., Ph. Fitzroy 6332.
AERO DIGEST BUREAU: 14th and F Sts., Washington, D. C., Phone National 2299.

American twin-motored transports for the England-Australia air race—Turner's Boeing and K. L. M.'s Douglas

AIR

Hot and Otherwise

●

FRANK A. TICHENOR

● The Ballynoo Deal is at it again! At both the ballyhooing and the dealing. This time it's the Senate Munitions Investigation. But the formula is the same as that used in the Banking investigation, the Air Mail contract cancellations, and the Benny Foulois mud-slinging mêlée. By now, you can probably recognize the fragrance of that formula blindfolded, so we need hardly remind you that it consists of punching below the belt of justice, holding out a stick of candy with one hand and slugging the hopeful recipient with the other, and blasting on the trumpets of ballyhoo to drown out all sounds of what's really going on. In other words, the New Deal's idea of rowing to the shores of economic recovery seems to be periodically to stand up on the gunwale and, with righteous inconsistency, start rocking the boat and berating the oarsmen as crooks and bums. These antics are supposed to spur the oarsmen on to greater efforts, even though they prevent them from getting their oars into the water. More important, however, they are calculated to impress the passengers with what a competent master Captain New Deal is.

It is not the claimed purpose of the Munitions Investigation which is objectionable—it is the real purpose and the method. The claimed purpose is to determine whether or not the munitions makers instigate wars to sell their wares. The real purpose—judging from the methods being used—is to make political capital by "proving" to the folks back home that here is another batch of dirty scoundrels who have been mulcting the forgotten man, and jeopardizing the public safety, to fill their own pockets.

Tracking Down Beasts

Investigation, they call it. According to old Noah Webster, "to investigate" in the accepted sense is to inquire and examine *patiently* and thoroughly for the purpose of ascertaining the causes and nature of any particular phenomenon. The definition implies an unprejudiced, scientific attitude of mind on the part of the investigator. But there is an archaic and abandoned definition of "investigate" which means to track down beasts.

Which is the definition of the Senate investigators? Obviously, the latter! Far from being unprejudiced, they bring their conclusions with them and use their investigation merely as a means of vindicating and publicizing those conclusions. This noble end they achieve by making it look to the gallery as though they are tracking down beasts.

All of their queries are leading questions. Some of them are downright inane. For instance, what could be more ridiculous than some of the questions which they put to the representatives of one of America's leading aircraft engine manufacturers? In an effort to expose them as culprits conspiring to "re-arm the Reich," they asked them if the engines they had sold in Germany for commercial aviation couldn't be synchronized with machine guns. Of course, they could! But so too could automobile engines or any other kind of machinery with a drive shaft—a fact which the astute Senators were clever enough not to mention.

Where's the Dividing Line?

They were also clever enough not to mention that almost any export commodity you may name can be converted to military use if the purchasing nation so desires. Cotton can be used to clothe armies, wheat to feed them, motor vehicles to transport them, and so on till the most insignificant article becomes a weapon of war or an item to help support a populace at war. Except for guns and ammunition, armored boats and airplanes definitely designed to wage war, there is no man alive wise enough to say what commodity is an implement of peace and what an implement of Mars. The question has come up time and again in history ever since the Napoleonic Wars when Wellington observed that an army advances on its stomach, as much as on its armament. Then who are these omniscient Senators that they can state without equivocation where peace ends and war begins in the international commerce of the world?

Aero Digest has never denied—and does not now deny—that there have been underhand dealings in the aviation industry. In fact, we have fought against just that sort of thing for years, long before these brilliant Senators decided they needed some publicity. But calling a few elements within an industry to task for their misdeeds and threatening ruin to the export trade of an entire industry are horses of vastly different hues. With its ballyhoo dynamite, this Senate committee is threatening to blow the export business of the American aircraft industry to smithereens.

Nothing is sacred to these gentlemen—except votes. Without proof and without qualifications, they drag the names of high officials of other nations through the mud of scandal, whether they be innocent or guilty. They hurl slander across the seven seas and stir up the winds of ill-will against the entire American nation. If they imagine they are fostering the cause of peace on earth, let them think again. It is hatred and resentment between nations that causes wars, and they are creating hatreds and resentments.

It is distrust that ruins trade—whether international or domestic—and they are inspiring a world-wide distrust for dealing with Americans. What a fine time we're going to have hereafter selling our aircraft and engines abroad, no matter for how innocent a purpose those planes and engines might be used! If we do retain a remnant of our export business, it will be only because our aeronautical products are immensely superior; for all things being equal, you can be sure that, as a result of the defamation heaped upon them by these Senators, those nations in the market for aerial equipment are going to give preference to our competitors.

The worst part about this dastardly performance, however—the ugliest part—is that it's like whipping your child for helping Mother with the household chores. For years, during this administration as well as the last one, the Government has urged the aviation industry to build up its export business. It has preached that an active trade abroad not only would take up the slack in the aviation market at home, but would help accelerate the general economic recovery. It even went so far as to aid and abet the industry in its efforts to sell American aircraft and engines to the nations of the world. And now—like a drunk-crazed father—it turns on the industry and thrashes it for doing the very things it taught it to do. No wonder business in this country is cowering! No wonder industry is afraid to go ahead! No wonder unemployment is mounting!

Grins and Groans from the Grandstands

●

CY CALDWELL

● Douglas Davis, winner of the 1934 Bendix Trophy Race and holder of a new unofficial landplane speed record of 306 miles an hour was well in the lead on the eighth lap of the Thompson Trophy Race when Death flagged him down. With his passing something fine and generous and wholly admirable has gone from aviation; he was, in every sense of the word, a noble gentleman.

No advancement of any science has been made without loss. Human knowledge fails to keep pace with human ambition; and in man's conquest of the air, in his striving for speed and yet more speed, the losses have been appalling. It is only reasonable that we should use every available means to insure that speed should not be too costly.

The present R License issued for racing planes by the U. S. Department of Commerce is a meaningless piece of paper which does no more than afford a pilot the legal right to meet death on a racing course. Certainly it gives him no protection by insuring, through adequate inspection and structural analysis, that the ship in which he is flying is strong enough to withstand the stresses that inevitably will be imposed upon it in racing flight.

No adverse criticism of the Department of Commerce is intended; their policy regarding experimental and racing airplanes has been a liberal one, and I believe that their liberality has been justified. There is a point, however, beyond which too much liberality becomes a dangerous liability; and such a point now has been reached. When pilots, designers, re-designers, choppers, and changers without number are permitted, almost entirely without benefit of engineering, to insert engines of higher horsepower in airplanes designed originally for a much lower horsepower, then the time has come for the trained experts of the Department to step in and say "Thus far may you go, and no further, in this particular airplane." I pretend to no engineering knowledge outside of the few essentials which experience has given to every old pilot, but it is obvious that an airplane stressed for 500 h.p., is merely another dangerous experiment when an engine of 800 h.p. is inserted and it is hurled sharply around the pylons at speeds far greater and with resultant strains far more severe than those for which the ship originally was designed. In this connection I urge your careful study of the paragraph on safety in his technical article in this issue of AERO DIGEST by Professor Klemin.

On the day after the races some part of the above was discussed by the members of the Professional Racing Pilots' Chapter of the N.A.A., to whose meeting I was invited by Secretary "Doc" Kincaid. It was recommended by the racing pilots themselves that a sub-committee of the N.A.A. should be appointed to inspect all racing planes and to pass upon their structural fitness or unfitness to enter a race. I have come to the conclusion that their suggestion offers no certain solution of the problem. Any N.A.A. committee, working under the dubious leadership of Hiram Bingham, would be suspected from its inception, and all of its pronouncements inevitably would be the subject of bitter dispute.

Secretary Vidal should take the entire matter under advisement, discuss the problems involved with his technical experts, and then draft new licensing regulations which will insure that these high speed races shall serve to advance the science of aviation and shall not be degraded into a Roman holiday for the sadistic entertainment of morons.

It is easy for the Department and for my good friend Eugene Vidal to dodge this issue; it is even easier for them to pretend to help air racing by drafting drastic control regulations which can serve only to strangle all original design.

Lee Miles' Miles & Atwood Special

OFFICIAL RESULTS OF THE AIR RACES

Bendix Transcontinental Speed Dash

Pilot and Home Field	Plane	Engine	Cu. In. Displ.	Speed (m.p.h.)	Money
Doug Davis, Atlanta, Ga.	Wedell-Wms.	Wasp	985	216.237	$4,500
J. A. Worthen, New Orleans, La.	Wedell-Wms.	Wasp	1,344	203.213	2,500

Event 1. 375 Cu. In. Displacement

Pilot and Home Field	Plane	Engine	Cu. In. Displ.	Speed (m.p.h.)	Money
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	201.767	$630
Art Chester, Glenview, Ill. ...	Chester Spl.	Menasco	363	201.027	350
Earl Ortman, Santa Monica, Cal.	Keith-Ryder	Menasco	363	159.063	210
Joe Jacobson, Kansas City, Mo.	Howard	Gypsy	318	157.542	140
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Cirrus	349	156.968	70

Event 2. Shell Speed Dash, 375 Cu. In. Displacement or less

Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	227.947	100

Event 3. 550 Cu. In. Displacement

Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	206.241	765
Roger Don Rae, Lansing, Mich.	Keith-Ryder	Menasco	544	204.770	425
Arthur Chester, Glenview, Ill..	Chester Spl.	Menasco	363	203.382	255
Harold Neuman, Moline, Ill...	Howard	Menasco	489	192.819	170
Roy Hunt, Oklahoma City, Okla.	Howard	Menasco	489	181.311	85

Event 4. 200 Cu. In. Displacement

S. J. Wittman, Oshkosh, Wis..	Popjoy	Popjoy	173	129.440	180
Willis Kysor, Niles, Mich....	Rasmussen Spl.	Rasmussen	190	112.523	100
Art Davis, Lansing, Mich.....	Houser Spl.	Contin'tal	115	110.944	60
Clarence McArthur, Miami, Fla.	Tilbury Flash	Church	108	102.626	40

Event 5. 375 Cu. In. Displacement

Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	202.183	630
Art Chester, Glenview, Ill.....	Chester Spl.	Menasco	363	199.295	350
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Cirrus	349	186.603	210
Earl Ortman, Santa Monica, Cal.	Keith-Ryder	Menasco	363	181.196	140
Joe Jacobson, Kansas City, Mo.	Howard	Gypsy	318	159.965	70

Event 6. Shell Speed Dash, 550 Cu. In. Displacement or less

Harold Neuman, Moline, Ill...	Howard	Menasco	489	222.859	150

The difficult course is to fashion such rulings as will insure that advancement is not retarded, but that will offer some protection to the pilots who fly experimental racing planes. The R license should insure that the planes are structurally right by analysis. At present R merely stands for Risky.

Well, what is there to say about a Henderson Bros. Circus, anyhow? If you've seen one, you've seen them all. The boys are the best showmen in the business, and they become more successful and less popular every year. Eventually some infuriated old pilot, denied a pass, will kill them; and then we'll have to start all over again, and train a new pair. But they *do* put on a great show, and that's all that need concern us. Even the Navy cooperates with them, and the new Naval slogan is, "Join the Navy and work for the Henderson Bros."

They're great boys in their way; yes, sir, in their own peculiar way. It was the best air circus I've seen, and I've seen nearly all of them. We also had a few races here and there, sort of sandwiched in. We had Dick Atcherly in crazy flying, and the Navy imitating Dick Atcherly, when it wasn't miles away from the field trying to get into formation, which was most of the time. When it came over it was good, though. The Marines were swell, and the Army was simply grand, while the Navy was immense when it finally got to us after fiddling about for hours in the hinterland. The Services made the show, though every act on the civilian bill was a headliner.

Roy Minor's Brown Special

Best show act was the U. S. Army Trio, the Men on the Flying Trapeze, Capt. C. L. Chenault, Lt. J. H. Williamson, Lt. Heywood S. Hansell. They had a few more tricks than the Canadian Siskin trio of several years ago, the best trio I had seen up to this year. Next best act was that of Milo Burcham, world's greatest single aerial acrobat, and next to him probably Gerd Achgelis, German stunt artist who flies upside down, like Hitler giving an imitation of normal thinking. The little German has a perfectly square head, and if he had landed on it by mistake I'd have backed it's crash-proof qualities against those of the undercarriage.

Most thrilling act for the crowd undoubtedly was the delayed parachute drop by Clem Sohn and Wayne Wagner. Art Davis and Roy Hunt continue to be the favorite acrobatic duo; their dog-fight is one of the most thrilling events the aviation world has witnessed, and their dual sky-writing is an example of precise airmanship that is a marvel to watch. Al Williams was excellent, of course, and miles ahead of the average aerial acrobat. Roscoe Turner, plus moustache, minus his lion, won the Thompson Trophy and made a new record from

Harold Neuman's Howard racer

coast-to-coast of 10 hours 2½ minutes. For years Roscoe has been trying to live up to the glory of his uniform, and at last he has caught up with it.

A few words more are all I can write, for we must make way for the advertisers who are yearning to thrust me aside and tell you of their wares. A word of praise for the highly-efficient Operations personnel, who ran the events off on time, when stern necessity did not interfere; great praise for Carl Schory and Capt. Underwood and Mr. Cordova of the Timer's Department, for their excellent work, without which the whole races would be timeless and meaningless. And last but not least, let us not forget to praise Jack Story and Barney Capehart at the "mike," whose excellent descriptions made the events intelligible to the crowd and whose sane and witty remarks made a happy contrast to the insane babblings of the idiotic radio announcers who sent a garbled version of the Thompson Trophy Race to a puzzled world, which now probably believes that all of us in aviation are just as crazy as radio announcers. But, of course, that isn't possible.

OFFICIAL RESULTS OF THE AIR RACES

Pilot and Home Field	Plane	Engine	Cu. In. Displ.	Speed (m.p.h.)	Money
Event 7. 550 Cu. In. Displacement					
Harold Neuman, Moline, Ill...	Howard	Menasco	489	211.553	$765
Roger Don Rae, Lansing, Mich.	Keith-Ryder	Menasco	544	211.003	425
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	203.176	255
Arthur Chester, Glenview, Ill..	Chester Spl.	Menasco	363	201.857	170
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Hermies	349	184.697	85
Event 8. 200 Cu. In. Displacement					
S. J. Wittman, Oshkosh, Wis..	Popjoy Spl.	Popjoy	173	113.498	180
Art Davis, Lansing, Mich.....	Houser Spl.	Cont'ntal	115	111.588	100
Willis Kysor, Niles, Mich.....	Rasmussen Spl.	Rasmsn.	190	84.982	60
Event 9. 550 Cu. In. Displacement					
Roy Minor, Hollywood, Cal....	Brown Spl.	Menasco	544	213.257	765
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	203.451	425
Arthur Chester, Glenview, Ill..	Chester Spl.	Menasco	363	203.030	255
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Cirrus	349	180.288	170
Roy Hunt, Oklahoma City, Okla.	Howard	Menasco	489	171.851	85
Event 10. Shell Speed Dash, Unlimited					
J. A. Worthen, New Orleans, La.	Wedell-Wms.	Wasp	1,344	302.036	....
Event 11. 1000 Cu. In. Displacement					
Doug Davis, Atlanta, Ga.....	Wedell-Wms.	Wasp	985	220.946	765
Walter Wedell, Patterson, La..	Wedell-Wms.	Wasp	985	219.498	425
Harold Neuman, Moline, Ill...	Howard	Menasco	489	202.538	255
Roy Minor, Hollywood, Cal....	Brown Spl.	Menasco	544	198.906	170
Roger Don Rae, Lansing, Mich.	Keith-Ryder	Menasco	544	198.519	85
Event 12. 375 Cu. In. Displacement					
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	199.752	630
Arthur Chester, Glenview, Ill..	Chester Spl.	Menasco	363	198.114	350
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Cirrus	349	176.240	210
Earl Ortman, Santa Monica, Cal.	Keith-Ryder	Menasco	363	159.029	140
Joe Jacobson, Kansas City, Mo.	Howard	Gypsy	318	155.347	70
Event 13. Shell Speed Dash, Unlimited					
Doug Davis, Atlanta, Ga.	Wedell-Wms.	Wasp	2,344	264.794	$250
Event 14. Thompson Trophy Race					
Roscoe Turner, Hollywood, Cal.	Md.W.-W.Spl.	Hornet	1,690	248.129	4,500
Roy T. Minor, Hollywood, Cal.	Brown Spl.	Menasco	544	214.929	2,500
J. A. Worthen, New Orleans, La.	Wedell-W. Spl.	Wasp	985	208.376	1,500
Harold Neuman, Moline, Ill...	Howard	Menasco	489	207.064	1,000
Roger Don Rae, Lansing, Mich.	Keith-Ryder	Menasco	544	205.358	500
Art Chester, Glenview, Ill.....	Chester Spl.	Menasco	363	191.597	....
Shell Qualification Speeds—Group 1—375 Cu. In. Displacement					
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	233.44	350
Art Chester, Glenview, Ill.....	Chester Spl.	Menasco	363	229.715	250
Earl Ortman, Los Angeles, Cal.	Keith-Ryder	Menasco	363	201.865	150
S. J. Wittman, Oshkosh, Wis..	Wittman Spl.	Cirrus	349	201.08	100
Joe Jacobson, Kansas City, Mo.	Howard	Gypsy	318	172.21	50
Shell Qualification Speeds—Group 2—550 Cu. In. Displacement					
Roy Minor, Hollywood, Cal....	Brown Spl.	Menasco	544	243.145	525
Harold Neuman, Moline, Ill...	Howard	Menasco	489	239.623	375
Roger Don Rae, Lansing, Mich.	Keith-Ryder	Menasco	544	235.336	225
Lee Miles, San Bernardino, Cal.	M. & A. Spl.	Menasco	363	233.44	150
Art Chester, Glenview, Ill.....	Chester Spl.	Menasco	363	229.715	75
Shell Qualification Speeds—Group 3—Unlimited					
Doug Davis, Atlanta, Ga.	Wedell-Wms.	Wasp	1,344	306.215	875
Roscoe Turner, Hollywood, Cal.	Wedell-Wms.	Hornet	1,690	295.465	625
J. A. Worthen, New Orleans, La.	Wedell-Wms.	Wasp	985	292.141	375
J. A. Worthen, New Orleans, La.	Wedell-Wms.	Wasp	985	248.913	250
Roy Minor, Hollywood, Cal....	Brown Spl.	Menasco	544	243.145	125

Seven trophies and more than $38,000 were distributed among the winning contestants of which $37,220 went to the pilots in the airplane group and $800 to the parachute jumpers.

EDITORIALS

"It is no longer a question of whether it is possible to operate an airline across the Atlantic. Rather, it is a question of which route can be flown now, and in the future, with the highest degree of efficiency."
—COLONEL CHARLES A. LINDBERGH.

Coordination of Technical Facilities

● Industrial advancement, as any human attainment, is primarily a product of brain and afterwards the result of mechanical accomplishment. Therefore, it is wasteful to concentrate on mechanizations without due regard for mental material. For uninterrupted advancement (independent of the general advancement of science and applied art elsewhere), industrial planning must include provision for adequate training of technical talent as well as the establishment of sound scientific foundation.

Universities and engineering colleges training scientific and technical experts should have Federal aid to enable them to foster and give the best training possible. The academic atmosphere, removed from mercenary interests and imbued with the spirit of pure science, is the proper place for scientific research, however abstract and remote from immediate technical applications.

Subsidies to these institutions would allow them to secure the best talent available, permit improvement in laboratory equipment, provide funds for research work and eliminate the time employed by individuals today on industrial research made necessary by lack of Federal funds. Such subsidies would create seats of knowledge, assuring the country of a definite number of highly-trained and competent scientists. Besides, it would make it possible for students to get the best obtainable training under the most capable guidance.

This would provide for the mental background of the industry. The next step is the more practical applied technical information.

Research and studies are at present scattered among the NACA, Bureau of Standards, Army, Navy and industrial laboratories (since 1929 averaging almost a million dollars a year). In addition to the complexity and lack of uniformity from these sources of information, different Government agencies issue specifications and rules varying in their requirements and sometimes differing only in the form of required presentation. It is an accepted fact that Army and Navy methods of technical procedure invariably differ. To avoid multiplicity of effort, obtain uniformity and standardization, and to use Government funds advantageously, the various organizations dealing in the aeronautics should be merged into a single national organization. As a matter of fact, funds now allotted to the NACA would be sufficient to carry on the work of the new national organization.

Universities and engineering colleges for aeronautics should create a properly-equipped and complete nucleus of scientists and research workers whose sole interest would be the advancement of scientific studies and general research. The national organization for aeronautics should be formed for more practical uses —to supply technical and engineering material in a form in which it can be immediately applied for practical uses. This seems particularly desirable since the Government controls the construction and use of all aircraft.

Functions of the National Organization

With these factors in mind, this national organization, employing competent men to correlate and put into practically applicable form the results of scientific investigation and general research carried out at the universities, would furnish information on methods, specifications, rules and standards. It would also keep informed of experimental research along applied lines. As it is the practice at present, the organization would make available the information by medium of published reports some of which would be available for general distribution, while others (in view of their importance in national defense) would be confidential and distributed only through the Army and Navy.

The facilities offered by a central organization could be offered for a nominal fee in the case of manufacturing firms, while inventors whose ideas were favorably passed upon by a committee, would be rendered services without any fee being charged.

Government agencies such as the Army, Navy and Department of Commerce, would have their sources of information centralized in this organization, thus resulting in uniformity and economy.

It will be interesting to see if the Federal Aviation Commission will give consideration to such a plan as outlined here —a plan which will not meet with the favor of politically-minded "scientists," but destined to give the aeronautical industry the technical help it needs in an immediately useful form.

Protection From Aerial Attack

● The following report was issued from the General Headquarters of the "Blue Forces" of the Army engaged in a "typewriter and paper" war:

"Black bombardment missions at dawn today again raided New York City and Washington, the enemy continuing his efforts to demoralize the civilian population and to terrorize the industrial area behind the front lines of the defending Blue Forces. Many buildings were destroyed, piers wrecked and the population was in a terror-stricken state, fleeing and choking the main roads, already crowded with refugees. Another Black squadron bombed two fields and destroyed many planes; the invaders are intent on demoralizing the population, and because of their air superiority are operating almost without check."

It requires no great stretch of the imagination to realize that such events could easily become an actuality in a war between the United States and any foreign power having a superior air force. It is generally recognized that in the strength of our aerial fighting forces we rank only fourth or fifth compared with other nations.

The maneuvering capacity and the striking power of the air arm considerably exceeds that of military land forces, and since an enemy's spirit could be broken by means of air attacks against centers of population, definite steps must be taken to alleviate or eradicate the possibility of such attacks on this country.

Every war always presents different aspects from the one preceding it, because of changed ideas about tactics and because of new technical developments. But this change has never been so radical as will be seen in future conflict as a result of the development following in the wake of the World War, which brought military and naval air troops into a separate and autonomous air force, with its potentialities for attack upon enemy country.

The question of disarmament is slowly being pushed into the background, for protection and security are becoming of increasing importance. England plans to double her fighting forces of the air. So does France and Italy. Other countries have the desire to do likewise. It is useless to think that any country will reduce or curtail its air force under such conditions as these.

Piloting for Profit

A. L. McCULLOUGH

● Transport aviation can continue the remarkable progress it has made in recent years by conducting its business with the greatest possible efficiency. Present economic factors, such as the recent drastic reductions in air mail compensation, increasing competition from ground transportation, and the generally low level of business activity, make the utmost economy of operation more necessary than ever before.

Economy in the air transport business demands efficiency in every branch; not only in the accounting, maintenance, purchasing and traffic departments, but in every division of the operations department as well. Up to the present, comparatively little attention has been given to the economic aspect of that part of operations dealing with the actual flying of planes. It has been customary in the past, and particularly among the smaller operators, to look upon flying costs as fixed and unalterable and to leave the pilots somewhat unsupervised and unquestioned as to the costliness of their individual flying, notwithstanding the fact that the flying costs constitute a very large part of the total cost of air transport operation.

Although strict limiting regulations are enforced by the transport companies, as well as by the U. S. Department of Commerce and corresponding departments in foreign countries, there is, nevertheless, a wide latitude within which good judgment or a lack of judgment may be shown in the way the pilot operates his plane. For example, in doubtful weather the pilot who has no instructions to the contrary, must know when to go through and when to turn back and land. Under similar circumstances, in good weather he must decide at what altitude to fly and at what speed to cruise. He can approach a field and land in such a way as to keep the passengers comfortable or so as to make them decidedly uneasy, and on the ground he can operate his craft so as to cause minimum or maximum wear and tear on the engines and plane parts.

It might be pointed out that varying changes of weather and condition of terrain and equipment cause deviations from the fixed methods usually practiced in the general order of transport operations.

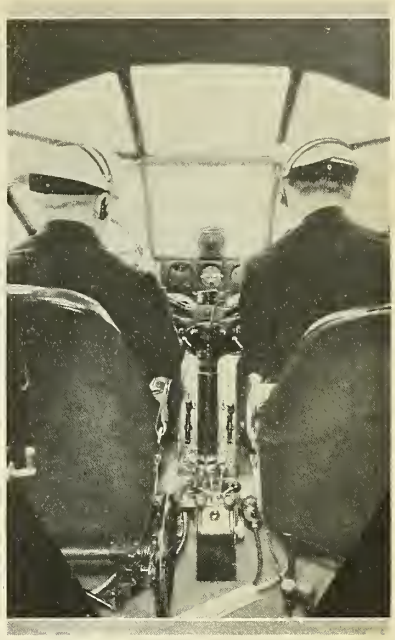
In these and many other details of airplane operation there are opportunities for the exceptional pilot to further the cause of economy. Although some pilots are fully aware of these opportunities and always devote their efforts toward efficiency and economy, nevertheless many pilots, even some with many years of experience, can show great improvement in this particular. This condition may be due in some cases to a spirit of indifference to the company's business, but, more often the thought may never had occurred to the pilot or it never may have been called to his attention. However, most pilots are fully aware of the fact that their flying is a most important part of their company's activities and they therefore count themselves an integral part of the entire picture.

It is probable that many pilots will characterize the observations in this article as self-evident and elementary, and it is hoped that to most transport pilots they are. Nevertheless, many of the ideas discussed are certainly not universal practice, and are presented in the hope of aiding in air transport development and in increasing the economy of travel by air.

●

The pilot in operating his plane, controls a great many factors which make either for economy or extravagance, and the most important single factors in this respect is the regulation of engine speed. On the ground considerable harm can be done to engines by insufficient warming up in cool or cold weather. Many pilots warm up their engines too quickly. They do not take off with cold engines, yet they arrive at a sufficiently high oil temperature without proper allowance of time for a thorough circulation of warm oil thru the entire engine. Engine failures at take-off due to cold engines are rare, but more engine wear is due to insufficient warming up than is commonly realized. In warming up the engines, it is also necessary that the wind direction be taken into account. With the plane "tailing" into the wind, dust and sand and even small pebbles and cinders may be blown into the propellers and air intakes, damaging both the propellers and the interior of the engine. And regardless of the wind direction, if engines are run up over loose cinders, gravel, or sand, small particles may be blown up, damaging the propeller blades.

The handling of throttles is important; suddenly opening and closing them places excess strain on the engine, particularly on gear trains and superchargers. In taxying, some pilots have a jerky manipulation of outboard engines of multi-motored planes. The same taxying speed can be achieved with less wear on engines and more comfort to passengers by smooth operation of all throttles together with a vigorous rudder action.



In the take-off, engines are run wide open for a few seconds but may be throttled down soon after leaving the ground, thus cutting down the wide open operation of the engines to a few seconds at each take-off. To allow engines to run wide open for a long time in climbing results in an unnecessary amount of wear, especially at the first take-off of the daily schedule, when the oil temperature is not as high as that maintained at usual cruising speeds. Unnecessary racing of engines in the air increases the fuel consumption while after landing, if the switches are cut quickly (particularly when engines are hot) it is liable to cause damage to the valves and to the gear trains if the engine back fires.

Every plane has one most economical engine speed with regard to gasoline consumed per mile per hour of air speed. This varies somewhat with the load but it is usually considerably below the speed accepted as the best cruising speed. The pilot should know the most efficient engine speed for his plane and at what r.p.m. an appreciable increase in fuel consumption is shown. This should be kept in mind so as to cruise at an increased rate only when absolutely necessary. For example, on a two-hour flight, if the plane is cruised for one hour at 50 r.p.m. less than is necessary to maintain the schedule, the engine speed during the last hour will probably have to be increased more than 100 r.p.m., to make up the lost time. This is due to the fact that a greater fuel consumption is paid for an increase of speed near the plane's top speed and for that reason the excess fuel consumed in making up lost time is con-

(*Continued on page 79*)

Night view of Shushan Airport's administration building as seen from the field, its architectural beauty accentuated by floodlighting

A Modern Airport and Its Lighting

H. E. LIPPMAN

Westinghouse Electric & Manufacturing Co.

● With the opening of the $3,000,000 Shushan Airport, the city of New Orleans added to the list of American air terminals one of the finest combined land and water facilities in the country. Constructed under the auspices of the Orleans Levee Board and named after the board president, Mr. A. L. Shushan, the airport is part of the Lake Front Development along five miles of the south shore of Lake Pontchartrain.

The airport site was created out of a submerged area, along the lake shore, six miles from the City Hall, offering the advantages of easy visibility from the air, accessibility, excellent facilities for seaplanes and non-interference with city street development.

The construction of the landing area involved some novel engineering features. The retaining wall was made of concrete sheet piling driven to resistance and braced against a duplicate parallel wall in deep water and against timber piling in shallow water. To minimize the thrust of the hydraulic fill of which the landing area was to be constructed, a back-fill of oyster shells was applied to the retaining wall. Where the water depth exceeded eight feet, protection against wave action was provided by a hydraulic clay fill covered by two alternate layers of willow mats and stone ballast, all submerged and extending outward 60 feet in a gradual slope.

Floodlights and tip-over cone

The area enclosed by the retaining wall was filled with clay and sand pumped from the lake bed, graded so that the space between the two converging runways and the retaining wall is drained toward the wall, while the center area is drained by concrete pipe lines leading to the city drainage system.

Runways

The physical conditions of the field limited the material for the runways to a resilient one which would "give" when the field subsided. After testing various mixtures, one was selected consisting of 60 per cent hot asphalt and 40 per cent of a commercial bituminous binder. The surfacing is four inches thick, comprising four 100-foot runways approximately 3,900 feet, 3,500 feet, 3,200 feet and 3,100 feet long, respectively. Since the light reflection of the material is very low, crushed oyster shells are rolled into the surface, giving it a light color which increases the effectiveness of the field floodlighting system. The layout of the runways is such that the longest is aligned with the prevailing wind, from the southeast; the others are orientated to conform with the other cardinal compass directions.

Administration Building

The central structure of the port's housing facilities is the 80 by 300-foot Administration Building which comprises a combination of modern architectural design with the utilitarian facilities required. Its outstanding feature is the glass-enclosed Control Tower which rises from the field side of the building and offers an unobstructed view in all directions.

After darkness the architectural beauty of the Administration Building is revealed by floodlights mounted on ornamental brackets and standards at eight different points. Lighting for the ground area around the building is obtained by pendant fixtures suspended from the brackets, using ten 500-watt floodlights, twelve 1,000-watt floodlights and twelve 300-watt pendant units. Separate multiple distribution circuits supply the floodlights and the pendant units.

The waiting room, extending two floors in height with a mezzanine balcony, occupies the center of the structure. The marble walls and terrazo floor are in warm color tones, and a sculptural frieze around the walls depicts the development of the airplane and steps in its production. Lighting is provided by luminous panels in the main ceiling and under the mezzanine balcony, supplemented by a modernistic fixture in the center. The dining room is also beautifully decorated, extending two stories in height and lighted by luminous ceiling panels.

Other facilities include accommodations for passengers and pilots, a field hospital, administrative offices and spaces for the U. S. Departments of Agriculture, Commerce and Customs and Immigration.

Hangars and Seaplane Dock

At present two 200 by 100-foot hangars have been completed, one on either side of the Administration Building, and space is available for future hangars, which will be duplicates of the present ones. The doors open on an apron at right angles to the taxi strip, having a clear opening throughout the length of the building. Each hangar includes shops, office space and facilities for the personnel, while an extension to one unit houses the transformer, switch room and steam boilers; the other contains the ambulance and other vehicles.

The hangar walls are illuminated by 200-millimeter, 180-degree Fresnel lens floodlights mounted on the walls near the roof and equipped with 1,000-watt Mazda floodlight lamps.

At the east end of the field is a seaplane ramp, leading from a dredged channel in the lake, with space on the shore for hangars. Although no lighting equipment is as yet installed, power and control cables have been laid to supply future requirements.

Revolving and Code Beacon

A 36-inch double-ended beacon, similar to those used on the Federal airways, is mounted on a tower on the hangar roof.

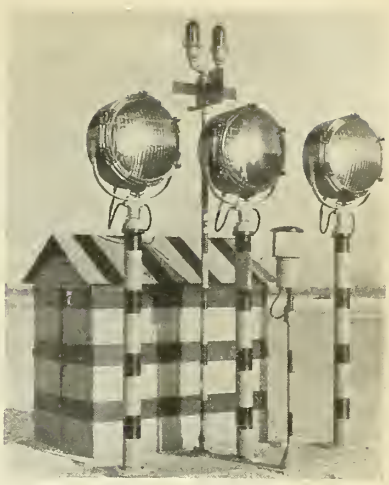
The light source is a single 1,000-watt, 115-volt Mazda bipost base beacon lamp mounted at the center of the drum. The optical system at both ends of the beacon is the same, consisting of an inner doublet lens and an outer sectional lens assembly. The beam candlepower is approximately 1,800,000 and the spread 4½ degrees. The speed of rotation is 3 r.p.m., giving a flash of .25 second duration every 10 seconds. An automatic lamp-changer is provided.

The auxiliary beacon, flashing the code letters "SA," is the standard 300-millimeter Fresnel lens unit consisting of two 360-degree lens sections, each with a 500-watt, PS-40 bulb prefocused base Mazda lamp and a green color screen. The code flashes are produced by a cam-operated mercury switch in the base of the revolving beacon.

Field Floodlighting

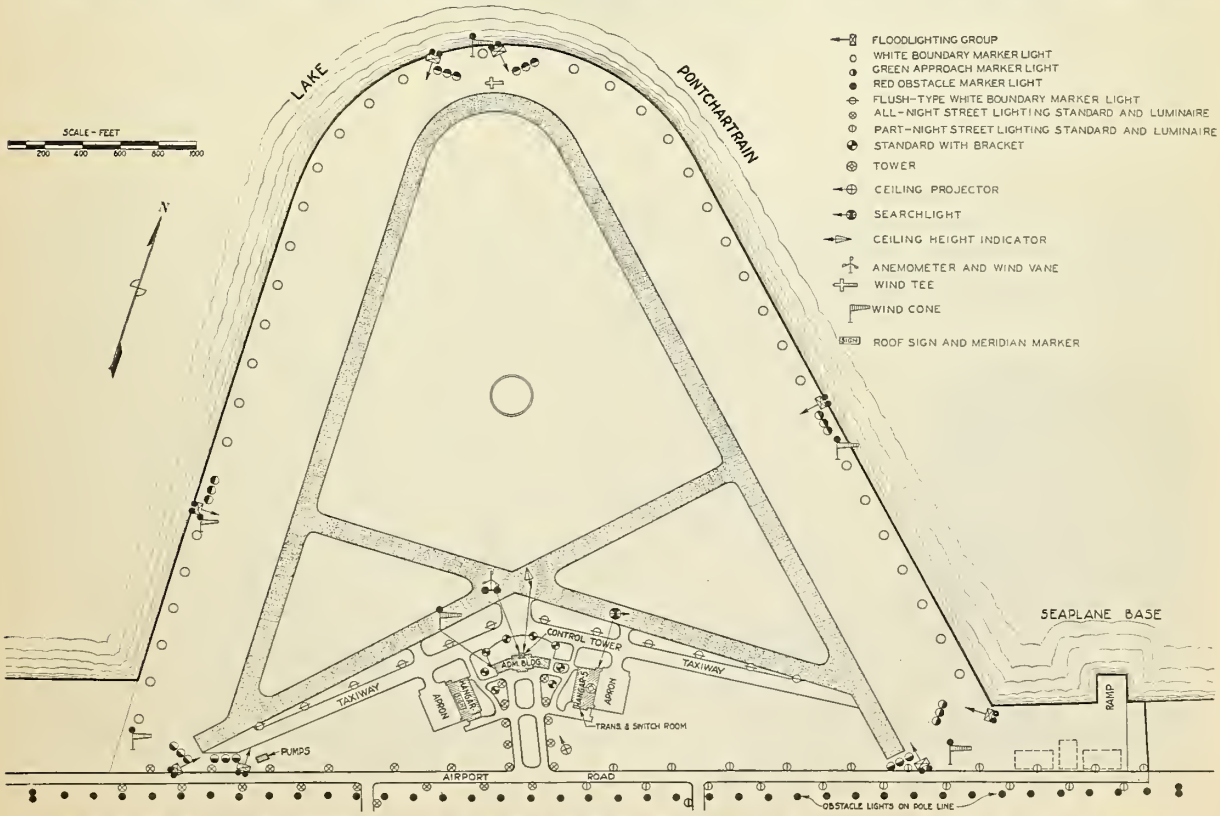
In conformity with its other advanced engineering features, Shushan Airport employs a unique system of floodlighting chosen after careful consideration of all the methods and equipment available.

It has been intimated that the selection of the hard-surface runway type of field was based on the desire to insure a firm surface for landing and take-off at all times and under all conditions. What is more logical then, than to make the operations during darkness independent of the wind directions by providing a universal lighting system, controlled by the operator in the control tower, giving the pilots lighting exactly in conformity with their needs? This would mean a separate group of lights at each end of each runway, located beyond the boundary and projecting their light in the direction in which the plane will land. Such a system has been installed at the Shushan Airport.



Group of landing field floodlights

Each of the eight floodlight groups



Diagrammatic plan showing complete layout of lighting equipment and facilities at Shushan Airport, New Orleans, Louisiana

consists of three Type CAG-25 Landing Field Floodlights, all similar except that two are equipped with 25-degree horizontal spread lenses and one with a plain lens. The latter produces a narrow beam of high candlepower for illuminating the distant end of the runway to a high intensity. The units are of cast aluminum, with parabolic precision mirrored glass reflector, a 3,000-watt, 32-volt Mazda lamp and a system of louvers mounted inside the door to cut off upward stray light.

The three 25-inch floodlights are supplemented by a fourth unit consisting of a 240-millimeter, 180-degree Fresnel lens floodlight equipped with a 30-volt, 30-ampere Mazda Projection lamp. This unit gives wide lateral light distribution to illuminate the foreground.

Power is supplied to the floodlight groups through an underground cable at 2,300-volts, single phase. At the rear of each group, there is a small steel shed, in which is installed an RCOC oil switch in the primary circuit to a 10 Kv.a. transformer. The latter is designed with a 32-volt secondary, and feeds the four floodlights through individual fused switches. Each oil switch is operated from the Control Desk through underground cable pilot circuits.

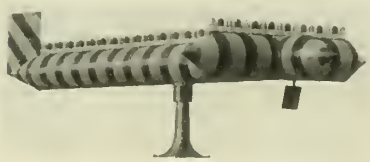
Field Marker and Obstruction Lighting

Each of the boundary and approach marker lights is mounted on a sheet steel "tip over" cone equipped with four radial wings for greater visibility, and painted in black and yellow stripes. The Flush Type Disconnects consist of a cast iron receptacle with a circular support ring which fits over the small end of a length of 10-inch sewer tile set vertically in the ground, forming a vault below the receptacle. The bases of the marker cones fit over the top of the disconnect, and are provided with spring clips to hold them in place against wind pressure. When struck a sharp blow, however, this snaps out.

The receptacle is provided with a porcelain disconnecting pothead, the cap of which is wired to the marker light, pulling out when the cone is knocked over. The circuit to the remainder of the units on the circuit is uninterrupted, and a cover on the pothead receptacle closes to exclude dirt and moisture.

The boundary along the building side of the field is marked by Flush Type Marker lights, consisting of watertight heavy glass lens floodlights set flush with the field surface.

The marker circuit is of the 6.6 ampere straight series type, supplied by underground cable connected to a 10 Kv.a., 2,300-volt constant current transformer. The primary circuit is also controlled by an RCOC oil switch operated from the Control Desk. The 36 boundary marker lights are equipped with white globes and 600 lumen lamps, while the 24 approach lights at the runway ends have green globes and 1,000 lumen, 6.6 ampere lamps. The 12 Flush Type markers are equipped with plain lenses and 600 lumen lamps.



Illuminated wind tee

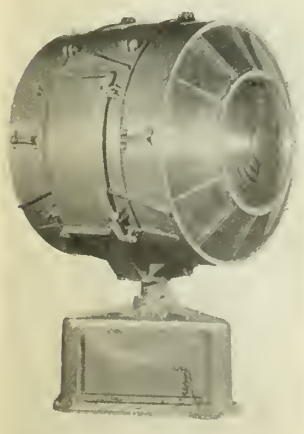
The airport is unusually free of obstructions and those which do exist are adequately marked. A telephone pole line along the south side of the field is marked by 38 single and two duplex series locking-type lights with guards, supplied by an underground series circuit connected to a 5 Kv.a. constant current transformer. The primary circuit is controlled by an RCOC oil switch operated from the Control Desk. Similar duplex marker lights are installed on pipe standards at each of the eight field floodlight groups, being connected in the series boundary circuit. All series obstacle lights are equipped with 1,000 lumen, 6.6 ampere series Mazda lamps.

The buildings are marked by multiple screw-globe type obstacle lights with 60-watt Mazda lamps.

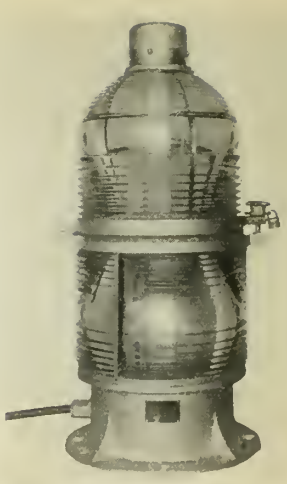
Wind Tee, Wind Cones and Searchlight

To indicate the direction and approximate velocity of the wind, a wind tee and wind cones have been installed.

The former consists of lengths of sheet iron tubing in the shape of a large letter T, pivoted on a shaft near the front. Its top is outlined with 29 white, green and red 25-watt marker lights, each color on a separate circuit. A wind pressure vane on the tee is mechanically connected to three switches so that as the wind velocity increases, the white, green and red lights are successively turned on, thus indicating the approximate velocity.



Double-end revolving beacon



Auxiliary airport beacon

Six wind cones are located on pipe standards at various points on the airport. The cones are the standard Department of Commerce type, 12 feet long, 3 feet in diameter at the throat and 12 inches in diameter at the tail, mounted on ring supports free to turn on the pipe standard. Illumination is provided by four angle reflectors with 100-watt Mazda lamps, mounted on arms extending from a red marker light on the top. The five cones located in the field and the wind tee, remote from a 115-volt source, are supplied by transformers connected in the series marker circuit and designed with 115-volt secondaries. The sixth cone, mounted on the Administration Building, is supplied directly from the Control Desk.

A 16-inch incandescent searchlight is mounted on one of the hangar pylons and the beam directed to the seaplane base at the east side of the field, where it indicates the location of the landing basin. The unit may also be manually controlled.

The searchlight is equipped with a parabolic mirrored glass primary reflector, secondary reflector, flat polished cover glass and a 30-volt, 30-ampere Mazda Projection lamp. The beam candlepower is more than two million and the beam divergence five degrees, while a transformer reduces the line voltage to that required by the lamp.

Ceiling Projector and Alidade

At Shushan Airport a convenient and accurate method for measuring the ceiling is used. The ceiling projector is mounted on a pipe standard about 500 feet from the Administration Building and tilted upward, toward the Control Tower, at an angle of 63° 26′. The ceiling height is then measured directly by means of the Alidade mounted at the

Control Tower, this instrument consisting of a free-turning periscopic sighting tube. A pointer on the tube indicates the ceiling height on a graduated scale.

The ceiling projector is a 16-inch unit with parabolic mirrored glass primary reflector, secondary reflector and flat polished cover glass. A 12-volt, 35-ampere Mazda Airplane Headlight lamp is used, producing a beam of three million candlepower. A transformer reduces the line voltage to that required by the lamp.

Traffic Control

When necessary to signal to planes in flight, either during the day or night, an advanced type of light-weight portable projector is used, comprising a 50 cp., 6-8 volt Mazda Auto Headlight lamp at the focal point of a primary and secondary reflector, with trigger-operated color screens to produce white, red or green light.

The signal is discernible for distances to 15 miles at night or 10 miles during the day.

The operator in the Control Tower can determine the direction and the velocity of the wind at any time. On the Control Desk are two instruments about the size of auto speedometers, one with a compass face and a pointer indicating the wind direction, and the other graduated to 90 miles per hour indicating the velocity. Both instruments are electrically operated by a combination anemometer and wind vane mounted on the Control Tower. The anemometer is the standard Weather Bureau 3-cup type, connected to a magneto which actuates the velocity meter on the desk. The wind vane shaft is connected to a position indicating transmitter, the exact position of which is followed by the pointer of the wind direction meter on the desk.

Anemometer and wind vane on control tower

The meters for the indication of wind direction and velocity are placed on the lighting Control Desk because they play an important part in the operation of the field floodlighting system.

Other Lighting

The driveways leading to the public highway are illuminated by 48 Octagonal Lantern luminaires equipped with refractors and 6,000 lumen, 6.6 ampere series Mazda lamps. The fixtures are mounted on single-light ornamental standards and supplied by underground cable circuits from the transformer room, where two 10 Kv.a. constant current transformers are installed, one to supply the part-night circuit and the other the all-night circuit. Both are controlled by RCOC oil switches in the primary circuits, which are operated from the Control Desk.

An exposed-lamp type sign reading "SHUSHAN AIRPORT NEW ORLEANS" is on the roof of Hangar No. 1. Illumination is provided by 686 twenty-five-watt Mazda lamps. A meridian marker is also provided, consisting of an arrow and the letter "N," illuminated by 98 twenty-five-watt lamps.

Lighting Control Desk

The operation of all lighting circuits is centralized in a special Control Desk in the Control Tower. The top panel of the desk, 32 inches square, slopes forward slightly to permit convenient access to and visibility of the apparatus, and is at a height which gives the operator an unobstructed view of the field. The desk top and sides are of sheet steel, the terminal board, fuse panels and relays being accessibly mounted on the inside.

A distinctive feature of the desk is the miniature airport runway plan, inlaid in metal foil on a sheet of micarta and mounted on the desk top. On the field plan are also mounted the wind velocity meter and the wind direction meter, actuated by the anemometer and wind vane discussed previously. At the end of each runway is a green Minalite to indicate when the floodlight group at that point is on. The proximity of the wind direction meter to the field plan enables the operator to tell at a glance which is the correct group of floodlights.

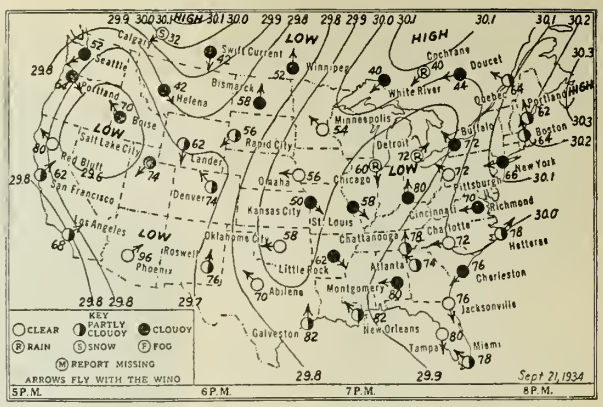
Lighting control desk (right) and radio equipment (left) in the control tower at Shushan Airport

Weather Map Reading For the Private Flier

NORMAN J. CLARK

● While the Department of Commerce does not require a knowledge of meteorology in its examinations for a Private Pilot License, it is undoubtedly true that many non-commercial fliers have at one time or another, wished that they had a little experience in the reading of a synoptic weather map, and in the proper use of the weather reports given over the radio facilities of the Department. Without an understanding, however meager, of the nature of line squalls, high and low pressure areas, dewpoint, principal cloud forms, and so on, the extensive network of teletype, weather observation, beacon, and radio communication stations maintained at the expense of the government is wasted for the pilot in question.

On the regular Weather Bureau map will be found a series of long lines, generally extending from North to South, approximately. Some of these lines are dotted ones, with a figure in degrees at each end. These are Isotherms, connecting points of equal temperature. As the dewpoint is only of interest when the temperature is known, it is well to watch these isotherms, their general direction, and the temperatures indicated by them. The solid lines are Isobars, and they connect points of equal barometric pressure.



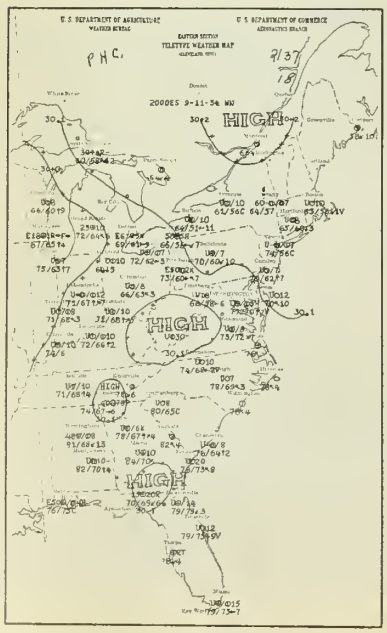
United States Weather Bureau Map published in the New York Times showing the weather over the nation on September 21, 1934. Such charts are prepared daily from data collected at 8 p.m. (E.S.T.) and the figures opposite cities show temperature at that hour

The barometer reading for each line is shown at the top and bottom of the isobar.

Scattered through the map are small circles with arrows through them. The arrow points in the direction of the wind, and the shading of the circle, or the initial in it, indicates the general state of the weather at that point. For instance, an R in the circle shows that it was raining at the locality in question at the time the map was made up. An S means snow, and when the circle is completely blacked out, a cloudy condition is meant. A half-shaded circle shows partly cloudy, and a clear sky is indicated by no shading. This information should be consulted whenever the pilot is plotting a cross-country course, in order that he may avoid any meteorological disturbances, which he might otherwise run into inadvertently. Radio is a necessary adjunct to long-range flying, but its utility is tremendously increased when its user is acquainted with the intricacies of meteorology.

A line squall, often as much as two hundred miles in width, is a rapid air movement, or high wind, accompanied by a long line of very dark clouds. It usually brings violent rain or hail, a change of wind directions and velocities, and a drop in temperature. It is indicated on the weather map by the V-shaped isobars. A line drawn through the points of the isobar "V"s is the line of the squall, which is usually in an East-West direction. High pressure areas are places of high barometric pressure. The winds follow the isobars outward in a clockwise direction, and they move

(*Continued on page* 80)



Teletype weather map, shown in reduced size, and explanation of the symbols approximately as shown on map

EXPLANATION OF SYMBOLS

Ceiling (given in hundreds of feet): "U" indicates unlimited; "E" indicates estimated.

Sky (given in symbols): ○, clear; ◑, scattered clouds; ◍, broken clouds; ⊕, overcast; F+, dense fog. Slant mark (/) immediately following symbol indicates "high", i. e., the clouds are 10,000 feet or higher above the surface; absence of slant mark indicates all clouds observed are below 10,000 feet, i. e., "lower". Combinations with or without slant mark are used as follows:

⊕/◍ (High overcast, lower broken clouds.)
⊕/◑ (High overcast, lower scattered clouds.)
◍/◍ (High broken, lower broken clouds.)
◍/◑ (High broken, lower scattered clouds.)
◑/◍ (High scattered, lower broken clouds.)
◑/◑ (High and lower scattered clouds.)
⊕ ◍ (Overcast, lower broken clouds.)
⊕ ◑ (Overcast, lower scattered clouds.)
◍ ◍ (Broken, lower broken clouds.)
◍ ◑ (Broken, lower scattered clouds.)
◑ ◍ (Scattered, lower broken clouds.)
◑ ◑ (Scattered, lower scattered clouds.)

A dash (–) preceding the symbol indicates "thin", e. g., –⊕/, high thin overcast. A plus sign (+) preceding the symbol indicates "dark", e. g., +⊕, dark overcast. The slant mark is not used with the "clear" or "dense fog" symbols.

Visibility (given in miles).

General Conditions (given in symbols): R, rain; FRR, freezing rain; SP, sprinkling; MI, mist; SL, sleet; HL, hail; S, snow; T, thunderstorm; F, fog; GF, ground fog; H, hazy; K, smoky; D, dusty. + or – indicates degree of intensity, e. g., R–, light rain; R, moderate rain; R+, heavy rain; K, smoky; K+, thick smoke, etc.

Temperatures (given in degrees Fahrenheit).

Depression of Dewpoint (given in number of degrees Fahrenheit below current temperature, when the depression is less than 10°): Indicated by a minus sign (–) and the proper number immediately following the temperature; thus, 70–5 means temperature 70°, dew point depression, 5°; 55–0 means temperature 55°, dew point depression 0°, etc.

Wind Directions: Indicated by arrows flying with the wind, as follows:

↑ South	↑↙ South Southwest
→ West	→↖ West Northwest
↓ North	↓↙ North Northeast
← East	←↖ East Southeast
↗ Southwest	→↗ West Southwest
↖ Northwest	↓↖ North Northwest
↙ Northeast	→↙ East Northeast
↖ Southeast	↑↖ South Southeast

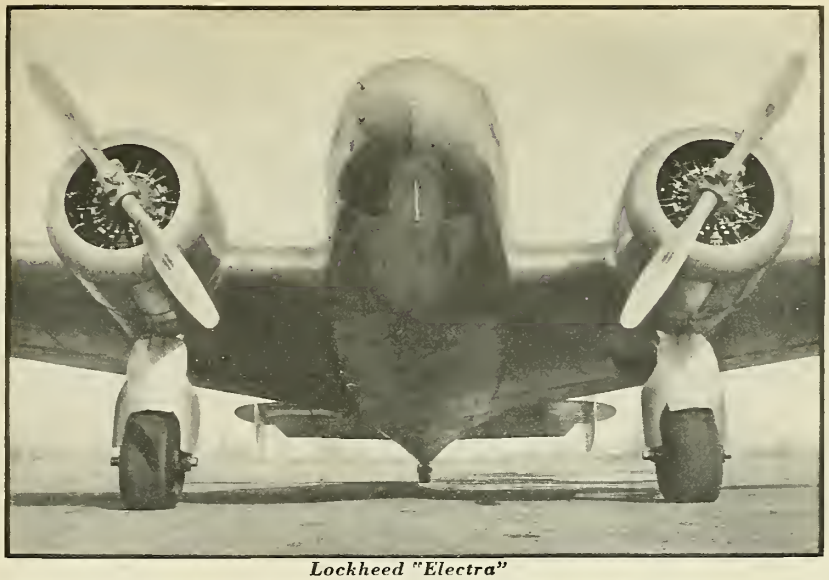
C Calm Q Wind shift line

Wind Velocity (given in miles per hour): G, gusty.

Example: E18⊕/◍4R–F–
65–2↗20G

Explanation: Ceiling, estimated, 1,800 ft. Sky, high overcast, lower broken clouds. Visibility, 4 miles. General Conditions, light rain, light fog.

Temperature 65°. Dew point depression 2°. Wind from northeast, 20 miles per hour and gusty.



Lockheed "Electra"

AIRWHEEL★ ALL AROUND

YOU can recognize them at sight — those big, fat, feather-bed Airwheels on the tail wheel and on the front wheels too.

Now that modern ships are built with retractable gears, the size of the wheel or tire makes no difference in flight — and accordingly designers have been quick to take advantage of the extra passenger safety and comfort — and the extra protection for the ship on soft field landings — which only Airwheel can provide.

With this, they also get the reserve power, the smoothness, the sure action, sure release of Airwheel disc brakes with non-energizing hydraulic control.

Have you investigated these advantages? Better write now to Aeronautics Department, Goodyear, Akron, Ohio or Los Angeles, California, and get the facts.

When you buy a new ship specify the Goodyear Airwheel and the new Goodyear Hydraulic Airwheel Brakes

NRA CODE

★ IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL!

AIRWHEEL is Goodyear's trade-mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of AIRWHEEL Tires

Personalities

by Caldwell

● IT IS not merely my opinion but is also the opinion of every pilot with whom I discussed the matter at the National Air Races that Milo Burcham is the most daring, the most original, and the most finished stunt pilot whom we have yet witnessed twisting a high-powered airplane into unusual positions. He did everything with a Boeing 100 except completely disassemble it—and he even may do that before he gets through. But I hope not. He is a fine young man, quiet, modest, unassuming, thankful for the interest and admiration of the crowd because it helps him in his profession of flying, but entirely unspoiled by it. He feels that he is just another pilot with the happy knack of being able to place an airplane in positions where he thinks it ought to be for entertainment purposes, and where an old conservative like myself regards it with a sort of dumb and dubious wonder, unable to figure out why it hangs there.

Incidentally, I have had a change of opinion on the matter of stunting. It is not that stunting has changed, or has become any safer, but aviation in general has progressed to a point of specialization where losses through stunting, racing, or hazardous long-distance flying no longer are a debit against airline or private flying, as they undoubtedly have been in the past. The public now understands that racing and stunting bear about the same relation to airline and private flying that automobile racing at Indianapolis bears to the automobile business. However, I don't recommend stunting to the average pilot; it requires a higher degree of skill, judgment, nerve-control, and fearlessness than 99 per cent of us possess. The sad part of it is that many misguided young men have found that out just a moment before they hit the ground; and then it was too late to do anything about it.

Milo Burcham, who inspired that old philosopher, Frank McKay, to remark that, "The heavens are being torn asunder by a shrieking mass of man and metal," was born in May, 1903, at Newcastle, Ind., the seat of the Indiana Village for Epileptics, which may or may not have had an effect on his flying. Until he was nine Milo lived on a farm, a barefoot boy happy in the placid companionship of contented cows, potato bugs, corn borers and other peaceful adornments of the rural regions, including cinch bugs. In 1912 his family moved to California, finally settling at Whittier. At the age of 24 Milo knew his fellow Californians well enough to enable him to select a useful and profitable occupation among those people: he started out selling burglar alarms, which were in great demand. Lloyd O'Donnell, of Long Beach, bought a burglar alarm and paid for it by giving Milo flying instruction. He finished his course in May, 1928, and soloed at Fullerton, Cal., then went to work in the oil fields to earn enough money to build up 200 hours' solo and to get married. It was easier to get married than to get the 200 hours; Milo got married first and got his transport license a year later. He also gradually collected two boys, Gary aged four and Vance aged 8 months.

His first flying job was as instructor at O'Donnell's School of Aviation, where he remained for several months, then became associated with G. A. Day at the Long Beach field. In January, 1933, he bought a Bird and started in the instruction game himself; but it was not until the 1933 National Air Races in Los Angeles that he became interested in stunting commercially. He purchased a Fleet and started in with that, being inspired, of all things, to break the inverted flying record of Tito Falconi of Italy. He broke Falconi's record on August 8, 1933, by flying from San Diego to Los Angeles in 1 hour 47 minutes. The following day Falconi set another record—2 hours 8 minutes; and next week the bold Milo flew 2 hours 20 minutes. Then Falconi flew inverted from St. Louis, Mo., to Joliet, Ill., in 3 hours 6 minutes, while Milo was on his way to Hartford to take delivery of his Boeing 100. On December 29 in that ship he set another record for inverted flight of 4 hours 5 minutes 22 seconds, which still stands. He had installed the motor upside down so that it was in normal position when the plane was inverted! How much simpler it would be to get a Beechcraft, pull up the wheels, and merely *look* as though you were upside down.

Milo Burcham at home in his ship

"While flying this time," he writes, "I pumped 40 gallons of gasoline with a wobble pump. This is a job in an upright position. Imagine how it is upside down! Most people feel that this type of flying is foolish and futile, but so are most games or sports that test skill and endurance. To my mind it does prove that a standard commercial plane is extremely well built when it will stand the extra stress put upon it by inverted flying . . . There is an element of risk in stunting, but I try to combine caution with my stunting and allow for a definite margin of safety. I always try to keep myself physically fit, and be prepared in that way to meet any difficulty that might arise."

That he always does surmount the dangers of his remarkable type of flying is my most sincere wish, for he is not only an excellent pilot but a very, very good egg of whom Indiana and California well may feel proud. In praising Milo Burcham for his work I wish to make it plain that I intend no invidious comparison with the work of any other aerial stunt artist, for it really is impossible fairly to compare the performance of different pilots in greatly different types of airplanes. In the glorious absurdity of his "crazy" flying, for example, Dick Atcherly was far ahead of Burcham in

(*Continued on following page*)

(*Continued from preceding page*)
his 1932 exhibition; about even with him in his 1934 show when he handicapped himself by sitting on the fuselage and trying to control the Curtiss Fledgeling with an elongated stick. In his Bird, Milo, with the exception of his act of picking up a handkerchief, was a poor second to Atcherly at his best—which we did not see this year. Also in his inverted flying at low altitudes Burcham was no competitor of Gerd Achgelis in his little Focke-Wulf, which is really a powered glider, and which gives him a decided advantage in this form of flying. So it goes—you really can't compare the work of these pilots, for it is so individual, so different. As an aerial act to thrill the crowd, however, I'll back Milo Burcham against the field.

● IN PRESENTING to my six readers pilot Elmer G. Dyer, Third Vice-President of the American Society of Cinematographers, I feel impelled to comment on the way the world has moved along since the time of Queen Victoria, an account of whose life I have just been reading. A decade or so before the turn of the century the good Queen gave a dinner to a few choice spirits at Balmoral Castle. One-eyed Connolly tried to crash the gate but was thrown out, after which the dinner went along in a sedate and stodgy manner. In commenting on the world at large, the Prime Minister declared that science and invention had reached their ultimate height; Lord Fuddydud said that by studying his geography he had discovered that the sun never set on the British Empire, while Lady Plushbottom hazarded the opinion that society now had jelled and that there would be no more social changes. "The Victorian era," she concluded, "is the eventual era. There will be no others."

"Well, I don't know," replied Queen Victoria, tossing a fish to the Lord Privy Seal, who was balancing a ball on the end of his nose for the entertainment of the diners. "You can't judge a chicken by the parsley round the dish; and you can't judge eternity by an era. You never can tell what will turn up where, or when. Pass the carrots."

Well Sir, at the very moment the Queen was speaking, who turned up in Kansas City, Mo., but Elmer Dyer, as an infant. The expression, "Where's Elmer?" undoubtedly started with him, once he could walk. He was always on the go, and still is. To give him more room the family moved to a ranch near Amarillo, Texas, at which interesting town young Elmer imbibed a modicum of education. In Texas there is a lot of land and sky, without much else to look at, so Elmer looked at the land and the sky and used to wonder what it would

Camera shot by Elmer Dyer

be like to fly above the clouds, as in 1905 or so an early wandering pilot had flown at a fair in Amarillo and had set the youthful Elmer's imagination to working. It was the only thing about Elmer that worked. In 1906 the family moved to Los Angeles, taking Elmer along and actually setting him to work at ornamental glasswork, at which he became an expert, turning out leaded glass windows for churches and ornamental glass designs for bars, thus taking care of two human spiritual needs at one fell swoop. When they get around to casting medals for those who have aided the human uplift, they should knock off two for Elmer.

Well, this sort of thing went on for years and years, and I'll get back to it and trace Elmer's course along the road to fame. But right now I'll leap ahead and tell you who Elmer is, for I doubt if many of you recognize him for the famous man he is within his own select sphere—Hollywood's ace flying cameraman. You know, when the motion picture starts there are several dozen names printed, and you never read them. Or I don't, anyhow. That's one of the human frailties, or perhaps it's just the human defense mechanism, that burns up the American Society of Cinematographers, Inc. It peeves them to know that we mugs out front remember the star and forget the cameraman, if we ever even noticed him. The only thing that makes them madder is to discover that we use one of their pictures in the magazines and forget to give them a credit line. Like all artists, cameramen are temperamental and unappreciated.

Elmer Dyer has contributed the aerial lens work to such cinema masterpieces as, The Air Circus, Going Wild, Lilac Time, Young Eagles, The Winged Horseman, The Dawn Patrol, Hell's Angels, (starring Howard Hughes as the angel) Flight, Cock O' the Air, Sky Devils, Suicide Fleet, The Squadron of Death, Ace of Aces, Hell Divers, Dirigible, Flight, The Flying Fleet, The Lost Squadron, Air Mail, Air Hostess, Central Airport, Speed Wings, and Night Flight—to mention only the outstanding pictures in which he has done the aerial photography. Up to date Elmer Dyer has logged over 3,000 hours in the course of his work with the camera, exclusive of his own private flying for pleasure. He has flown with the Army, Navy, and Marine Corps and holds honorary photographer's ratings from all three. He also has flown with such nerve-wracking airmen as Frank Tomick, Frank Clark, Bob Blair, Paul Mantz, and Dick Grace in all sorts of stunts, calmly grinding away in the face of imminent death.

In all of that time Dyer has never received a scratch in a plane. He has had several forced landings, several minor crack-ups, with one pilot or another, but never an injury, proving again, what I've always maintained, that flying is safe —if you're lucky. I flew for over 15 years and never got even a hang-nail. And during ten months of that time gentlemen over the lines were shooting playfully at me, too. And never hit me. Fellows like Elmer and me are practically indestructible. It's only when we buy stocks and bonds that our luck runs out.

Meanwhile, where's Elmer? Back in Los Angeles, in 1906, he worked at his glass business for years and years, doing photography on the side. He used to take those family groups you now see only in albums in country districts—Uncle Abner with his hand clamped on Aunt Carrie's shoulder, and Aunt Carrie with a look of grim determination on her face. Many's the time Elmer has had a camera blow up right in his face, after the savage impact of one of those family groups on the sensitive plate.

(*Continued on page* 80)

Elmer G. (Gunner) Dyer

IMMENSE PAYLOADS
with the economy of single engine performance

WELL over two tons—a tremendous payload (Aircruiser 4920 lbs.—Seacruiser 4150 lbs.)—speeded along at almost 2½ miles per minute in safety and with the economy of single engine operating and maintenance costs. A distinct achievement made possible by Bellanca design's most efficient use of engine horsepower!

Actual operating costs (everything included) of the Bellanca Aircruiser or Seacruiser are from one-fourth to one-third those of most two and three motor ships now in service—and the Bellanca payload is from one-fourth to one-third larger. Can the airline operator responsible for the safe transport of passengers or freight at a profit to his company afford to overlook such performance?

Can he afford not to send for facts to compare with his present operations?

BELLANCA AIRCRAFT CORP.
New Castle, Del.

Bellanca Aircraft of Canada, Ltd., Montreal

"SPEED, PAYLOAD, SAFETY, ECONOMY — BELLANCA GIVES THEM ALL"

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • DR. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

The High Angle Stall and Spin

GARLAND POWELL PEED, JR.

● With the Department of Commerce writing the stalled landing into its requirements, and the increasingly strong belief among designers that the private pilot type of airplane should be able to land safely by "pull her back and let her sit" handling, the question of flight without power at, or past, the stall becomes of paramount importance. It is this type of flight that will make such a landing possible, and the purpose of this article is to bring attention to one method of handling this problem.

Flight with power and flight without power, though both based upon air reactions, are greatly dissimilar in the method of obtaining these reactions and their manifestations afterwards. In the first case, loading per square foot and parasite resistance are of slight importance beyond determining the various speed factors. In the second case they are of primary importance in determining the flight path and attitude. This is brought about by the conditions that in the first case, with power, the flight path is level and there is no sinking, the balance of thrust against resistance being held to achieve this end. In the second case, without power, forward flight is obtained by adjusting the attitude of the airplane so that the reactions derived from sinking have a forward component and move the airplane ahead. As long as these conditions are met there is no stall, even though the airplane be flying at an angle of attack of 40° or more. In powered flight, the stall is the point at which the airplane begins to sink if the angle is increased. In gliding flight the stall occurs when the airplane begins to lose forward speed.

In flight without power, there are two conditions—the low angle glide that acts entirely similar to powered flight and the high angle sinking glide with which this article is primarily concerned.

Strictly speaking, the changes between these conditions are slow and the change from powered flight through the low angle glide into the sinking or stalling glide are gradual and fade into each other, but the differences are discernible and can be used to the designer's advantage.

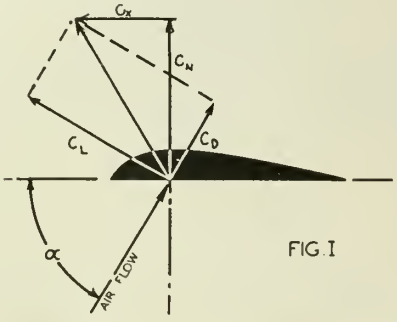


FIG. I

It is possible that by changing the conception of the stall, the difference between these conditions can be removed. To stall something means to stop it, and no airplane ever stops until it gets on the ground. Therefore, the term stalled flight or "stopped flight" seems somewhat confusing. However the use of the term in its present sense is so well established that a change would be difficult and perhaps undesirable.

A body above the earth accelerates towards it until its air resistance equals its weight—whether it be a bomb, a brick or an airplane and it matters little whether the airplane be falling flat or diving. However, in the case of an airplane or airfoil, the air resistance is not a simple drag reaction, but has a resultant generally pointed fore or aft. If, in addition to the vertical motion there is forward motion as well, the direction of the resultant may be any point from dead ahead to dead astern. This is shown in figure I.

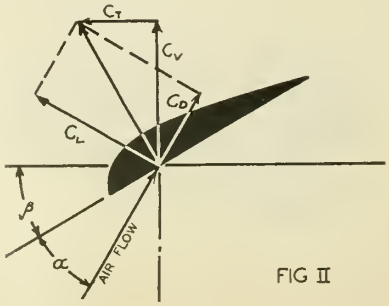


FIG II

In the case of a loaded wing, it is evident that the total resultant force cannot be used to obtain lift. In fact only its vertical component designated as C_n is useful in finding the lift and sinking speed. Lift is the force operating against gravity and is equal to w the weight. This, however, leaves a forward or rearward component, designated as C_x. C_n could be noted as C_z to conform to NACA standard terminology.

The values of C_n and C_x are readily calculated from C_L and C_D and the angle α. The formulas are:

$$C_n = C_L \text{ Cos } \alpha + C_D \text{ Sin } \alpha$$
$$C_x = C_L \text{ Sin } \alpha - C_D \text{ Cos } \alpha$$

This however covers only one general condition, when the chord line is parallel to the horizon. The wing may be pitched up or down, in which case the values change. These new values C or vertical coefficient and C_T or thrust coefficient may be obtained either direct from C_L and C_D or from the values of C_n and C_x.

If the nose is pitched down, or negative (figure II) through the angle β, these formulas become:

$$C_V = C_L \text{ Cos } (\alpha + \beta) + C_D \text{ Sin } (\alpha + \beta)$$
$$C_T = C_L \text{ Sin } (\alpha + \beta) - C_D \text{ Cos } (\alpha + \beta)$$

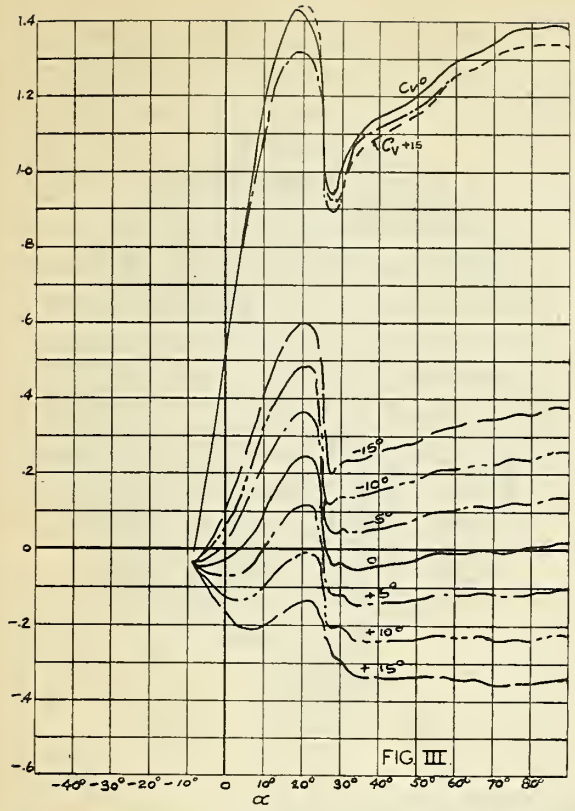
And if pitched up, or positive, they are:

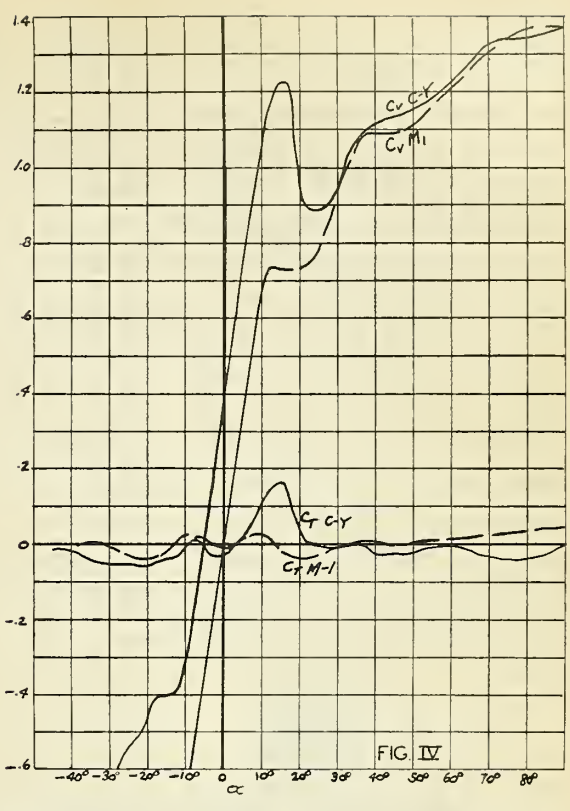
$$C_V = C_L \text{ Cos } (\alpha - \beta) + C_D \text{ Sin } (\alpha - \beta)$$
$$C_T = C_L \text{ Sin } (\alpha - \beta) - C_D \text{ Cos } (\alpha - \beta)$$

The formulas for obtaining these values from C_n and C_x are easily written by the use of trigonometry.

From these formulas a curve of C_T and C_n values are readily obtainable and figure III shows them plotted for a Gottingen 387 monoplane section. (Reference I). Where C_T is zero is, of course, a point of equilibrium, where plus the wing will gain speed and where minus will lose it. As in flight a gain of speed means a decrease of angle, it is evident that the lower point of equilibrium is self-

References:
[1] *Causes and Preventions of Flat and Inverted Spin* Garland Powell Peed, Jr. AERO DIGEST, June and July, 1930.





correcting, whereas any change from the upper point tends to increase in magnitude. The importance of this upon spinning is self evident, and the effects a change in section will have upon the spinning qualities of an airplane are readily ascertained.

In fact, by an analysis of the two curves plotted for an entire airplane, the spinning properties may be determined before the airplane is tested. Such curves should be obtained in a wind tunnel and preferably at a Reynolds Number corresponding to the stalling speed of the airplane.

Referring again to figure III values of C_T for $\pm$ 5°, $\pm$ 10° and $\pm$ 15° are plotted in to show the effect of pitch of various angles. C_V for $\pm$ 15% is also plotted in, however its effect is slight and can be neglected. By interpolating between the values of zero and $-5°$, it is apparent that at an angle of pitch of $-3°$ the airfoil has no second point of equiiibrium. This, however, is misleading as in the case of a complete airplane the resistance of the other parts would pull the C_T down and below the line again. In a well-designed airplane it would probably follow the same contour as shown and the displacement would be mostly vertical. In figure IV, the Clark Y and M-I section are plotted (Reference 2) for comparison.

From the analysis of figures III and IV and assuming a vertical displacement of 0.1 of the zero line to account for parasite resistance, it is evident which section would be best for the private plane. The Gottingen 387 shows by far the best gliding qualities; this is borne out by actual test in which this section shows a great ability to stall-in. The Clark Y is second and the M-I last. With higher Reynolds Numbers (these were tests at 153000) some change would be made but the relative stalling point would remain about constant.

From a theoretical standpoint, a C_T curve of constant positive slope would be desirable, but how to obtain it is not clear. From a rapid check, the thick wing with some bottom concavity gives a nearer approach to it than any other type. This type gives high angles for the second point of equilibrium and thereby a high stalled glide. The value of $d\ C_L/d\ \alpha$ should be constant and continue to high angles plus a low value of $d\ C_D/d\ \alpha$. As C_T depends largely upon C_D at low angles and C_L at high, C_D should be low and C_L high for the best results. The longer C_T is plus, the greater the gliding ability of the section, and therefore the airplane. The thin, so-called racing type of section will not be suitable even though its $d\ C_T/d\ \alpha$ is generally positive, due to its small range of positive C_T values. Nose-down, such a section gives good characteristics, but as the type of landing we desire is with nose high, and this section has all negative values at such an attitude, it is of no value. With flaps down the values would probably be positive, but I have no data available upon such a combination and so cannot predict the results. In fact, the available data on sections at high angle and at full scale is meager in any case.

In general, the biplane characteristics closely resemble the monoplane and the effects of stagger and gap are slight. Decalage has some effect. Minus decalage being helpful, an effect that would be evident from the wing arrangement. The difference between + 25% and — 25% stagger is only 4° in angle of equilibrium, with the greater effect, 3°, between 0 and + 25%. The greatest change by far is upon C_V, which is materially reduced at the higher angles as the stagger is decreased.

In the analysis using a slotted wing, Clark Y with fixed slot (Reference 3), the effect of the slot is shown to be a prolonging of the initial positive value of $d\ C_T/d\ \alpha$ to higher angles and greater value. The second point of equilibrium is moved only slightly however and the greatest effect is to little better than double the best positive value of C_T. The curve also takes on some of the character of that of the Gottingen section, and reaches its peak at an angle of attack of

References:
[2] NACA Report No. 317.
[3] NACA Report No. 407.

approximately 25° whence it drops abruptly, in sharp contrast to the gradual slope of the unchanged Clark Y. The best positive value is also about 58% larger than the Gottingen 387 and peaks at 5° higher. Owing to the fact that the report I used carries the angle of attack to only 26°, a spinning analysis was not possible. But it seems there would be a possible auto-rotation range at about 28° to 35° angle of attack, and a second range at 60° to 80°. In the unchanged Clark Y these ranges are from 20° to 42° and from 60° to 80° as above.

In general, testing of auto-rotation in the wind tunnel has been taken about the center of the airfoil. However it is doubtful if such a spin ever occurs naturally, possibly the very flat spin may approach it. As a purely theoretical conception it is possible, but the large number of variable factors entering into spinning, such as progressions, fin and fuselage areas etc., would make it improbable that such could occur. In addition, the flat spin is necessarily at a high angle, over 45° generally, and the conditions for such a rotation generally prevail at 10° to 20° lower.

Span Loading Conditions

In figure V, the five possible conditions of span loading that might occur are shown, noting that in any low value of C_T a minus or rearward force may occur instead of the positive values shown. C_V could be minus only at extremely low or minus angles. As in any spin the inner tip is at a greater angle than the outer; these figures represent the spread of angles between the two. The first condition, A, that of constant loading in both C_V and C_T is naturally very rare but in effect due to the lower speed of the inner tip would revert to a spiral dive as the inner tip sank and lagged behind. Such a condition would revert to straight flight immediately upon release of the controls. The second condition, B, with both outer end coefficients greater, would tend to the same result. Both of these loadings would give the normal spin, and are the conditions generally prevailing at a neutral angle of attack of 25° to 35°. In the third condition, C, which is a special case of the first two, both C_V and C_T are greater on the inside. Such a condition prevails in the Gottengin 387 at very high angles of attack and when it occurs a spin is impossible as the inner end with its higher lift and greater thrust tends to overcome the spinning and reverse it. This condition, though rare, is possible and has been reported before in a previous article of mine (Reference 1) and the ship in question went through the condition of B, then A and last C, at which point, at a large angle of attack, no spin was possible. Cabin loading was responsible for the changes in this instance.

Condition D, if ever occurring, has not been recognized. Theoretically it is perfectly possible and would manifest itself in an attempt of the ship to twist the inner wing ahead and roll over on its back, or if the C_T was moderate to merely roll upside down.

Condition E is definitely dangerous, and is the condition of loading responsible for the "flat spin." The low value of C_T toward the spinning axis makes the inner wing lag behind and tends to increase the angular velocity. At the same time, the high inner value of C_V keeps the wing up in spite of the lower speed. The inner C_T may even be reversed and be negative. In any case, if the ship is able to attain the angle necessary the C_T slope can be almost zero and still the airplane will spin down and the pilot will probably resort to his parachute. The combination of positive $d\ C_V/d\ \propto$ plus zero or negative $d\ C_T/d\ \propto$ is a thing to beware of. Of course, the slopes should be taken for the whole airplane as the tail, fuselage etc., will have some effect upon both values.

In making an investigation of spinning it would be well to investigate angles of pitch from — 45° to + 50°, as the centrifugal force due to the angular velocity will cause a displacement of the resultant force which is derived from gravity and the outward thrust. This displacement in effect tends to increase the angle of attack, and the true angle will be somewhat larger than the apparent. As the exact spinning attitude is almost impossible to predict, due to interference, etc., a shot-gun method of approach is necessary. With the understanding that should the progression of moments due to weight distribution have high positive values, a close examination would be desirable, and if an unfavorable slope of the type shown at E, figure V shows up, it would be necessary to make some change in the construction. Of course, the righting moment due to the horizontal surfaces must be considered, but if M_x is positive the condition of A, B, or C (figure V) should be approached, if possible. This is especially true of the low wing monoplane, whose M_x is generally positive. For such an arrangement thin double cambered tips with thick roots are generally safe, as are certain sections whose $d\ C_T/d\ \propto$ is positive at the higher angles. For any monoplane $d\ C_V/d\ \propto$ is invariably plus at above 30°.

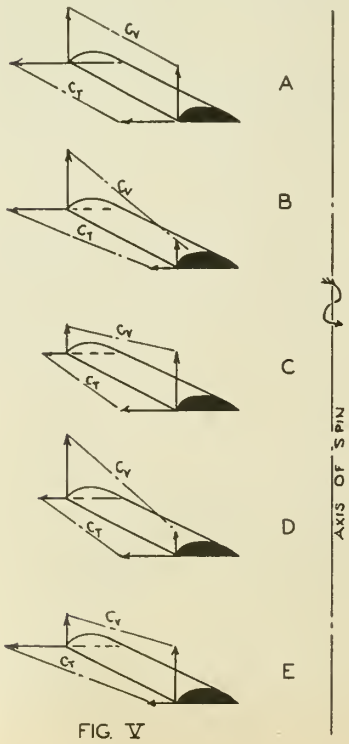


FIG. V

Correcting An Erroneous Idea

As a result of this study of C_T and C_V inter-related, it is possible to state that the general conception that large negative stagger is a fore-runner of undesirable spinning qualities is erroneous. Such a construction would normally follow the slope distribution of A, B, or D, all of which are safe, though D is somewhat erratic. In fact the range of stagger from + 25% to — 5% is probably the most dangerous in spinning qualities. In general, negative stagger will come under the condition of B. The effect of the fuselage usually being to make $d\ C_T\ /d\ \propto$ negative at the high angles. For this reason, the tests to obtain C_L and C_D should be made upon a complete wind tunnel model and at as high a Reynolds Number as possible, to obtain values to properly ascertain the spinning properties of the actual airplane.

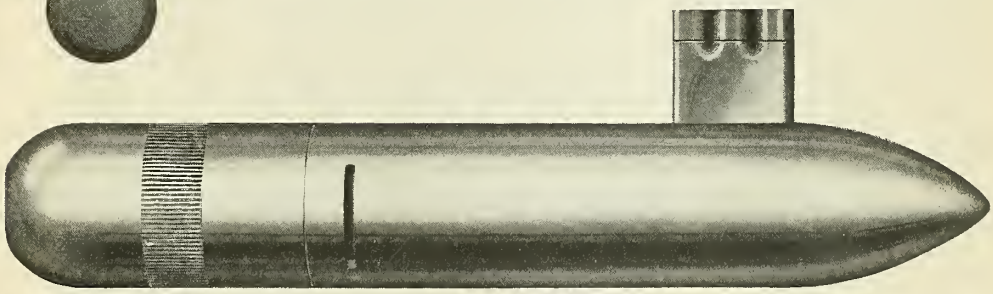
The prediction of the exact spinning attitude is not possible as yet, for the method is not old or complete enough. However, it is possible to recognize the danger signs and to determine a construction to avoid them, a process which should be of practical value to the designer.

This article does not take into consideration factors, other than aerodynamic which have varying effect upon the spinning qualities of an airplane. The effect of wing movement, slip and skid are neglected also. Such data are available and in use. This is an exposition of one of the factors, though an important one, that comprise the spin, and it is not intended that this method be used as a cure-all. It is a means of recognizing certain danger signals and a pointer towards their elimination. It is no simple matter to cure bad spinning, and this article only attempts to lessen the labor and perhaps reduce the cost.

PIONEER ROTATABLE AIR SPEED INDICATOR and ELECTRICALLY HEATED PITOT STATIC TUBE

ROTATABLE AIR SPEED INDICATOR *Type* 735 is an essential instrument, carefully designed to be quickly and easily read in conjunction with other instruments of the flight group. It is usually placed immediately to the left of the Turn Indicator...the Climb Indicator being placed on the opposite side.

The mechanism may be rotated so that when a predetermined air speed has been attained, the pointer assumes a horizontal position on the right hand side of the dial...The Rotatable Airspeed Indicator employs the same high grade mechanism used in all standard Pioneer instruments. Available ranges, 200 to 300 MPH.



ELECTRICALLY HEATED PITOT STATIC TUBE, *Type* 357D... positively prevents ice formation at low temperatures, thus insuring operation of the Air Speed Indicator at all times...It is an established fact that within a certain low temperature range, ice will rapidly form on various parts of an airplane. The Pitot Static Tube, because of its small dimensions, may be rendered completely ineffective often before the airplane itself has been seriously affected by the ice load. Concurrently with this ice forming condition, low or zero visibility is usually encountered, making it necessary for the Pilot to depend entirely upon his instruments. The perfection of the Heated Pitot Static Tube makes possible reliable airspeed indication, regardless of temperature. To provide for various methods of mounting, Pitot Static Tubes, type 357D are offered in three models. All three models have the same Pitot Static section as illustrated above.

PIONEER INSTRUMENTS

PIONEER INSTRUMENT COMPANY INCORPORATED

BROOKLYN • NEW YORK • A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

A Nomogram for Load Factor Determination

DR. G. P. CASIRAGHI

● When the new airworthiness requirements became effective the first of this month, the term *High Angle of Attack* was replaced in Bulletin 7-A by the term *Accelerated Flying Condition I* (maximum up-gust).

In order to save time and effort in determining these basic load factors in accordance with the new requirements, I have constructed the Nomogram which I believe will interest the technical readers of AERO DIGEST. In the course of my work, I am often asked these load factors for a variety of values of gross weight, power, wing area and velocity. For these purposes, I found the Nomogram useful and simpler to use than the mathematical computations required by the Bulletin. Because of the complexity of the mathematical expression of the new load factors, the advantage of obtaining these factors by means of a diagram may well be perceived.

In accordance with the proposed requirements the greater of two load factors has to be used for the basic flying condition I. One is a function of the gross weight of the airplane and of its power loading, and is determined on the Nomogram as the point intersected on the load factor scale by a line through the gross weight and power loading. The other one is a function of the high velocity of the airplane, the wing loading and wing characteristics, and an "up" gust of 30 ft. per second. This "gust load factor" is determined on the Nomogram as the point intersected on the load factor scale by a line through the wing loading and velocity. The Nomogram has been constructed for a slope of lift curve $m = 4.25$, which is a good average value for the most used airfoils with an aspect ratio of 6. The design load factor is taken as 1.5 times the applied load factor, assuming thus a factor of safety of 1.5, but it can easily be computed for any other value of factor of safety, from the applied load factor.

It is believed that the accuracy of the values determined by the diagram is well within ± .03 of unit load factor.

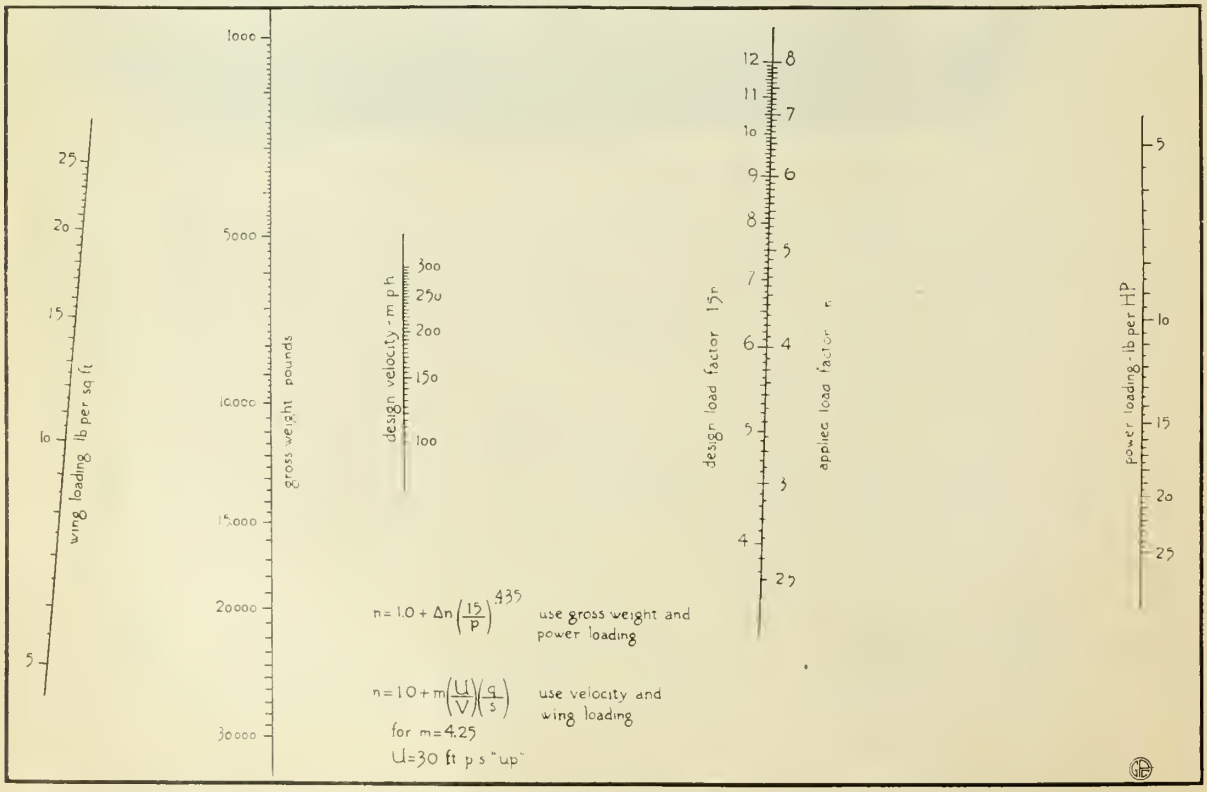
The table of values determined with the Nomogram compares well with the values computed in Table I of Dr. Klemin's article on the new airworthiness requirements which appeared in the August, 1934, issue of AERO DIGEST.

Gust Load Factor

Wing Loading lb./ft.	Velocity miles per hour	Design Load Factor Computed by Dr. Klemin	Design Load Factor Determined with Nomogram
10	228	9.15	9.15
15	196	5.85	5.90
20	200	4.85	4.85
10	158	6.78	6.80
15	169	5.26	5.30
10	146	6.37	6.40
15	151	4.88	4.90
10	137	6.1	6.10

Usual Load Factor

Gross Weight pounds	Power Loading lb./h.p.	Design Load Factor Computed	Design Load Factor Determined with Nomogram
2000	5	10.29	10.3
2000	15	6.95	6.95
6000	10	6.66	6.65
6000	20	5.31	5.33
10000	10	5.87	5.88
10000	25	4.46	4.45
20000	10	4.85	4.85
20000	15	4.31	4.30
30000	10	4.32	4.33
30000	15	3.87	3.88



Nomogram for determining applied and design load factors for basic "accelerated flying condition I"

ON THE LINE...

Here the evolution from an engineering plan to an operating plane is almost complete. After finishing touches — and the final inspection that every Boeing-built airplane gets before flight — another fleet of high-speed transports will go into service! . . . Boeing Airplane Company, Seattle.

BOEING

• BOEING HAS ALWAYS BUILT •
TOMORROW'S AIRPLANES TODAY

NRA

Dynamic Forces in Airships As an Aid to Maneuverability

CARY RUSSELL ROBERTS*
Captain, U. S. Air Corps Reserve

● In designing a rigid airship, the designer must choose some method for deriving the preliminary dimensions of the airship. If he follows the usual procedure, he considers the hull as a beam and calculates the forces acting upon this beam. The hull is loaded with the different weights acting downward, with the lift due to the gas in the cells acting upward and with aerodynamic forces which may act in any longitudinal plane. It is therefore necessary that the calculations of the stresses should include these factors.

Loads are either static or dynamic and they must be computed independently and then added algebraically to obtain the resulting stresses. Static loads are those due to weights, gas pressure, outer cover tension, initial tension in wiring and various similar items. Dynamic loads are those caused by the accelerations of the airship and are most important in modern airships due to their size and speed.

While the designer is often given the volume, length and diameter of the finished ship at the time he starts the design, these are limitations rather than aids to the solution of his problem. The ultimate aim of his calculations is to produce as light a structure as possible and at the same time have sufficient strength to resist the maximum stress to which it will be subjected.

However, there is another important fact that must be remembered if the design is to be successful and that is satisfactory performance. Since performance includes many qualities such as high speed, endurance and great weight carrying capacity, it will be seen that it is the most vital aim of the designer to produce an airship capable of giving the best performance possible while keeping within the limits governing the design.

The designer uses dynamic forces as an aid in combating the restrictions to which he must comply in solving the difficulties encountered due to the limitations set upon his design by the specifications.

There are three major operations in the handling of a large rigid airship that require the application of dynamic force for control. These are: the take-off of the airship; flight at constant altitude; and the landing of the ship.

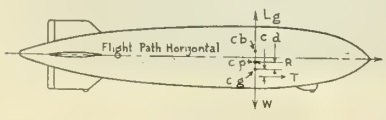


Figure 2. Flight at constant altitude

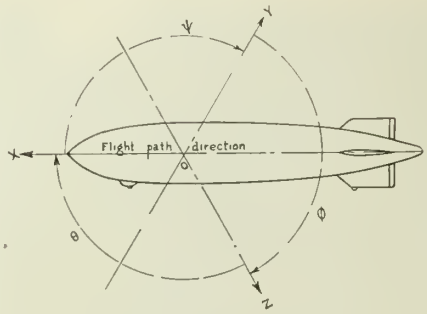


Figure 1. Axes of an airship

It is the duty of all personnel operating an airship to be thoroughly familiar with the dynamic forces that can be employed under any given operating condition. Since they must apply this information with judgment, it is necessary for them to understand, at all times, the correct relationship between the static forces and the dynamic forces acting upon the airship.

Due to the fact that this article is intended to discuss dynamic forces in airships only from the point of forces introduced to aid maneuverability, it is important to remember that all dynamic forces are not in the discussion.

In order to avoid confusion when referring to forces, Figure 1 has been drawn. In this figure, which conforms to the established practice of the National Advisory Committee for Aeronautics and the American Standards Association,

X = Longitudinal Axis
Y = Lateral Axis
Z = Normal Axis
Θ = Angle of Pitch
Φ = Angle of Roll
Ψ = Angle of Yaw
L = Moment about Rolling Axis
M = Moment about Pitching Axis
N = Moment about Yawing Axis

The forces are conveniently resolved into directions parallel to three axes. These are called axes of reference and are mutually perpendicular. Forces parallel to the axis OX are termed *Longitudinal Forces;* those parallel to the axis OY are called *Lateral Forces* and those parallel to the axis OZ, *Normal Forces.*

The simplest case to be considered is when an airship is flying with its longitudinal axis horizontal and we are maintaining constant altitude. If we assume that there is no cross wind and no change in static forces, it will be simple to consider this flight at constant altitude.

In this case the total thrust of the propellers is used to overcome the resistance of the airship. Figure 2 shows the forces and moments which will act under these conditions. In it,

c.g. = Center of Gravity of the Airship
c.b. = Center of Buoyancy
W = Total Weight of Live and Dead Loads
Lg = Lift of Inflating Gas
R = Total Resistance of the Airship
T = Thrust of the Propellers
c.p. = Center of Pressure

The moment of the lift of the inflating gas which acts through the center of bouyancy *c.b.* will be

$$Lg = Lg \times 0 = 0$$

The moment of the total weight of all live and dead loads acting through the center of gravity *c.g.* will be

$$W = W \times 0 = 0$$

The moment of thrust about the center of gravity will be

$$T = T \times c$$

The moment of resistance about the center of gravity will be

$$R = R \times d$$

It can be seen however, that a dynamic load must be placed upon the tail so that the airship will not tend to nose up. Increasing this load will cause the ship to climb; decreasing the load will cause the ship to dive.

In addition it should be mentioned that the rudder is held neutral during these maneuvers. In order to turn to the left or to the right, the rudder must be pushed over adding another dynamic force caused by the aerodynamic force acting upon the rudder.

When the nose of the airship is inclined up or down the problem is not as easy to solve as before, but is still fairly

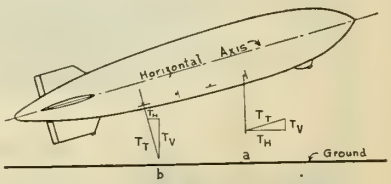


Figure 3. Thrust of the propellers

simple. However, when the stability is modified by a heavy or light airship with its nose tilted up or down, there are several other moments that must be considered. Since the dynamic forces that must be applied vary more in magnitude than in manner of application, a detailed analysis will not be given.

The take-off is begun by aerostatic forces, but as soon as there is sufficient altitude, the engines are started and dynamic forces are utilized. The thrust from the propellers acts along the longitudinal axis and by inclining the axis so that an angle will be made with the surface of the ground (in level country) the airship will climb. By raising the elevators, a dynamic force is caused to act upon the tail forcing the nose upward and the propellers then drive the ship along the new path. In the Navy dirigible U.S.S. *Macon,* built by the Goodyear-Zeppelin Corp., the propellers are of the swivel type and can be rotated so that they drive the airship upward with a certain amount of helicopter-like motion.

Figure 3 shows an airship during take-off with half of the propellers rotated until they revolve parallel to the longitudinal axis. The thrust of an ordinary propeller is shown at (*a*); the thrust of a tilted propeller of the swivel type is shown at (*b*). The total thrust in (*a*) and in (*b*) $= T_T$; horizontal thrust in each case $= T_H$ and the vertical thrust in each case $= T_V$. The dynamic force from these propellers greatly increases the lift of the airship and reduces the time necessary to reach the cruising altitude. However, the decreased force along the longitudinal axis can readily be perceived.

The landing is the most difficult part of the flight and requires skill in maneuvering the ship. The application of dynamic forces must be under control and due to the size of modern airships these forces are much greater than those employed in the smaller ships that formerly were built.

In order to make a good landing three essential steps must be followed: the weighoff at safe altitude; the approach to the landing field; and maneuvering of the ship into the control of the landing party.

The weighoff should be conducted in the immediate vicinity of the landing field and whenever practicable just before the anticipated landing. The ship should be headed into the wind and the engines throttled down until the dynamic forces become small due to the decrease of airspeed. The airship thus becomes practically a free balloon and will show the condition of its buoyancy. Its condition may be "light," "heavy" or "equilibrium" according to the relation of its loads and the lifting force of the gas in its cells.

A small amount of dynamic lift is useful during the weighoff; otherwise it will not be easy to regain control. This force will be obtained from the idling propellers unless the wind is unusually strong.

The information gained during the weighoff will determine the method of approach to the landing field. However, every factor must be carefully watched during the approach to insure proper procedure when the ship has reached its landing speed and is ready to be received by the landing crew.

Conditions frequently occur where there is a change of density near the ground. If the ship becomes heavy, ballast must be dropped. The acceleration of a heavy ship may be checked by synamic forces if it has propellers of the swivel type. Some of the propellers may be rotated to a horizontal position and their direction of rotation reversed. If these are run at slow speed the danger of a heavy landing is reduced. However, the airship may become light, and in this case, dynamic force from a few propellers rotating in a horizontal plane is useful.

Recent Patents

The following patents of interest to our readers are from the U. S. Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Aircraft of the rotative sustaining wing type, and aircraft with rotative sustaining blades. Juan de la Cierva, Madrid, Spain, assignor to Autogiro Co. (1,969,781 and 1,971,033)

Aircraft construction. Alphonse F. La Fon, New York, N. Y. (1,969,804)

Navigating instrument. John G. Nelson, Baytown, Tex. (1,969,939)

Gyroscopic compass and latitude indicator. Alexander Chessin, New York, N. Y. (1,969,965)

Air mail receptacle. Samuel Ludlow, Jr., West Hartford, Conn. (1,970,011)

Aircraft propeller. Albert P. Wiegand, Pittsburgh, Pa. (1,970,114)

Navigating instrument. Victor E. Carbonara, Brooklyn, N. Y., assignor to Pioneer Instrument Co. (1,970,543)

Altimeter. Victor E. Carbonara, assignor to Bendix Aviation Corp. (1,970,544)

Dirigible. Hugo K. Deubel, Hartford, Conn. (1,970,647)

Aircraft. George F. Myers, Jackson Heights, N. Y. (1,970,812)

Airplane propeller. Orma L. Gibbs, Kansas City, Mo. (1,970,847)

Airplane. Roland M. Gruss, San Francisco, Calif. (1,971,003)

Propeller. Clinton H. Havill, South Orange, N. J., assignor to Eclipse Aviation Corp. (1,971,006)

Aircraft having sustaining rotors. Joseph S. Pecker, Philadelphia, Pa., assignor to Autogiro Co. (1,971,016)

Mounting structure for aircraft sustaining rotors. Harold F. Pitcairn, Bryn Athyn, Pa., assignor to Autogiro Co. (1,971,017)

Aircraft, particularly of the rotative type. Agnew E. Larsen, Huntington Valley, Pa., assignor to Autogiro Co. (1,971,043)

Safety parachute for airplanes. J. Krasnodmsky, Milwaukee, Wis. (1,971,377)

Sustaining device for aircraft, aileron, and aileron and flap construction. Edward F. Zaparka, New York, N. Y., assignor to Zap Development Corp., Baltimore, Md. (1,971,590, 1,971,591 and 1,971,592)

Tail wheel construction. James H. Kindelberger, West Los Angeles, Calif., assignor to Douglas Aircraft Co. (1,971,613)

Airplane construction. Giuseppe M. Bellanca, New Castle, Del. (1,971,637)

Engine and propeller arrangement chiefly adapted for airplane and like aircraft. Victor Ehmig, Paris, France. (1,971,645)

Aircraft sustained by a lifting screw. Edward A. Stalker, Ann Arbor, Mich. (1,971,734)

Helicopter airscrew. Jesse A. Jackson, Lutherville, Md. (1,971,820)

Aircraft. Trian Berbeck, Baltimore, Md. (1,972,005)

Construction of aircraft disk-type landing-wheels. George H. Dowty, Cheltenham, England, assignor to Bendix Aviation Corp. (1,972,216)

Method of operating aerial vehicles. Sterne Morse, Richmond Heights, Ohio. (1,972,242)

Stabilizer for airplanes and aircraft propeller. Albert B. Gardner, Racine, Wis. (1,972,336 and 1,972,337)

Propeller hub, variable-pitch propeller mechanism and integral hub for reversible-pitch propellers. Walter S. Hoover, Girard, Pa. (1,972,485, 1,972,486 and 1,972,487)

Automatic altitude propeller. Zeus Soucek, East Orange, N. J., assignor to Eclipse Aviation Corp. (1,972,669)

Parachute apparatus. Herbert L. Adams, Washington, D. C., assignor to Irving Air Chute Co., Buffalo, N. Y. (1,972,813)

Handling apparatus for airships. Calvin M. Bolster, Lieutenant, Construction Corps, U. S. Navy. (1,972,863)

Gyroscopic compass. Reginald E. Gillmor, New York, N. Y. (1,972,882)

Airplane safety device. Victor F. Zahodiskin, Cincinnati, Ohio. (1,972,967)

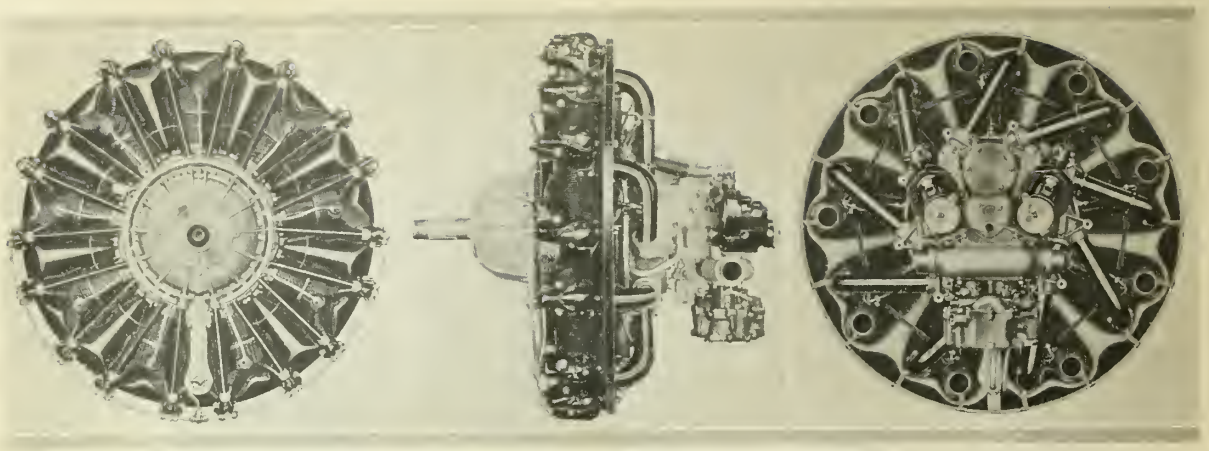
High wing airplane. James Vernon Martin, Garden City, N. Y. (1,973,007)

Brake for airplanes. Walter W. Rothenhoefer, St. Louis, Mo. (1,973,017)

Variable-pitch propeller. Glenn R. Brooks, Hunting Park, Calif. (1,973,046)

Airplane structure. Hylton Swan, Upper Montclair, and Sigfried Higgins, Verona, N. J., assignors to Bakelite Corp. (1,973,124)

Sky sign. Hans G. Gordon, Toronto, Ont., Canada., assignor to Aero Advertising Co., Ltd., same place. (1,973,205)

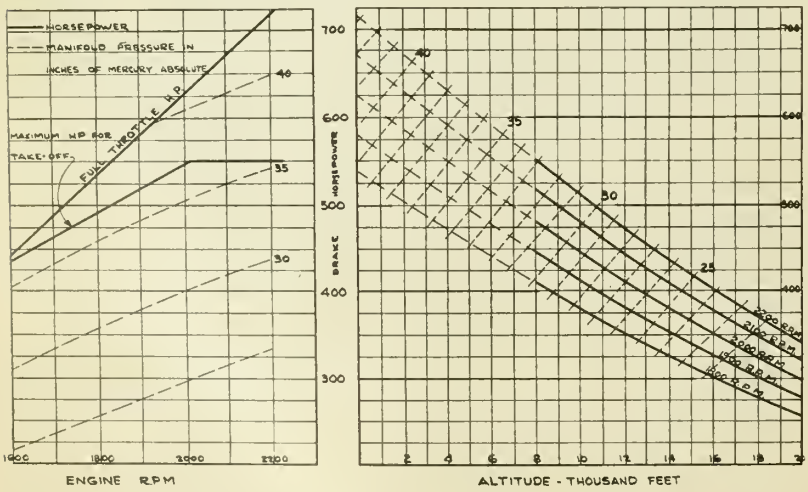


The Pratt & Whitney Series S1H1-G Engine

● The new 550-horsepower Pratt & Whitney Series H Wasp engine evidences one of the most important advances in aircraft engine design in the automatic lubrication by engine pressure or splash of all principal moving parts. This feature is carried out in the entire valve-actuating mechanism which is designed to require no manual lubrication, since oil is fed to the valve tappets, rocker bearings, etc. The necessity for periodic manual lubrication is thereby eliminated, and not only is time and labor saved, but also constant proper functioning of these parts is assured for longer periods. Cold weather starting is made easier by the elimination of grease in the rocker boxes.

Considerable engineering effort over a period of years has been directed toward the redesign of parts so as to lessen the attention to servicing operations on the part of pilots and mechanics. Hundreds of hours of dynamometer testing, as well as complete flight tests in a twin-motored Boeing transport have demonstrated the reliability of the many new features incorporated in the Wasp Series H engines, the first of which, the geared type Model S1H1-G has been awarded Approved Type Certificate 129.

United Air Lines is taking delivery of ten new Boeing transports equipped with the S1H1-G engines and three-bladed Hamilton Standard controllable-pitch propellers and plans to re-equip its entire fleet of these high-speed, all-metal ships with the new engines and propellers. In addition, Roscoe Turner and Clyde Pangborn will fly a similar Boeing 247-D, also powered by the S1H1-G engines in the forthcoming MacRobertson races.



Power curve of the Pratt & Whitney S1H1-G engine, showing horsepower and manifold pressure at sea level (left) and at altitude (right)

The Series H will include two additional geared and two direct drive engines. In the former group is an engine which will deliver its rated power, 550 h.p., at 5000 feet instead of 8000 feet, (as in the S1H1-G) using 80 Octane fuel instead of 87 and having a blower ratio of 10:1 and a compression ratio of 6:1. The third geared engine in the series will deliver 500 h.p. at 10,500 feet on 80 Octane fuel. One of the direct drive engines will deliver 550 h.p. at 2200 r.p.m. at 5000 feet, and the other is rated at 525 h.p. at 2100 r.p.m. at sea level, using 80 Octane fuel.

Details of Construction

The experience gained from the development and use of its long line of successful engines, in military and civil operation, has resulted in many improvements in detail which are incorporated in the present Series H Wasp engines. Parts which have been redesigned and strengthened in order to insure even longer life and increased durability are the master rod and link rods, crankcase, supercharger drive, valves, pistons and rings, crankshaft main bearings and the accessory drive. The recent new developments (in addition to the automatic valve lubrication) consist of automatic oil temperature control, priming carburetor, fine fin cylinder heads, shelf-mounted cam (which adds a reinforcing flange to the crankcase) pressure baffles between cylinders, oil tightness throughout, controllable-pitch propeller control on rear of sump, new and shorter shielding arrangement for all ignition wiring and a short hot spot in the induction system.

Cylinders are of composite construction, the barrel portions machined from steel forgings. Heads are aluminum-alloy castings, screwed and shrunk on the bar-

rels, and rocker boxes are cast integral with the heads. All the heated portions of the head are literally washed with cooling air. Exhaust ports provide maximum cooling and ease of connection to the manifold, and unusually fine finning is employed both on the head and barrel, providing adequate radiating surface. There are 2 spark plugs per cylinder, located in the fore and aft plane.

The short push rods are made of heat-treated aluminum alloy tubing fitted with hard steel ball ends. The entire valve gearing is completely enclosed.

Pistons are machined from aluminum alloy forgings and balanced before assembly, permitting replacements to be made from stock parts with the assurance that they will not vary from allowable tolerances. They are of the 6:1 compression ratio type, having flat heads with recesses for intake and exhaust valve heads. Piston pin bosses have been strengthened and the under side of the heads are ribbed for strength and to provide additional area for heat dissipation. Each piston has 4 compression rings and 1 scraper ring of increased tension which results in better oil seal.

The rear section comprises 2 major castings—the blower portion which provides the blower ring and 9 separate outlets to which the cylinders are connected, and the rearmost casting, which forms the supercharger diffuser section and carburetor inlet elbow as well as the support for all accessories.

On the rear section casting of the new engine are mounted, a Bendix-Stromberg Model NA-Y9B double-barrel carburetor, two 9-cylinder type Scintilla magnetos, oil pumps, oil strainer, fuel pump, 2 gun-synchronizer drives, 2 tachometer drives and the generator drive. Provision is made for mounting and driving a vacuum pump, providing the necessary suction for the operation of flight instruments and also a pressure unit, if necessary, for the operation of other equipment including de-icers.

The rear section assembly, similar in design to the rear end on single-row models, has built into it a General Electric centrifugal-type supercharger. The supercharger drive is of the outboard bearing type with the intermediate shaft anchored at the extreme ends by precision-type ball bearings. This design provides equally balanced gear action and increases the rigidity of the gear train. The impeller shaft is mounted on 3 precision-type ball bearings.

Integrally cast vanes provide balanced diffusion of the fuel mixture and vanes in the intake elbow provide even distribution to the supercharger. A priming carburetor, with larger chokes than on previous models, utilizes its accelerating pump to supply the necessary charge for starting. Thus long priming lines and the usual priming pump are eliminated. Flooding is prevented, the resultant fire hazard is reduced, and fumes from the priming source are kept from reaching the pilots cockpit. The carburetor elbow and entrance to the supercharger impeller provide for uniform distribution of air and liquid entering the impeller. Because of this feature the engine idles and runs smoothly over its entire range of operating speed.

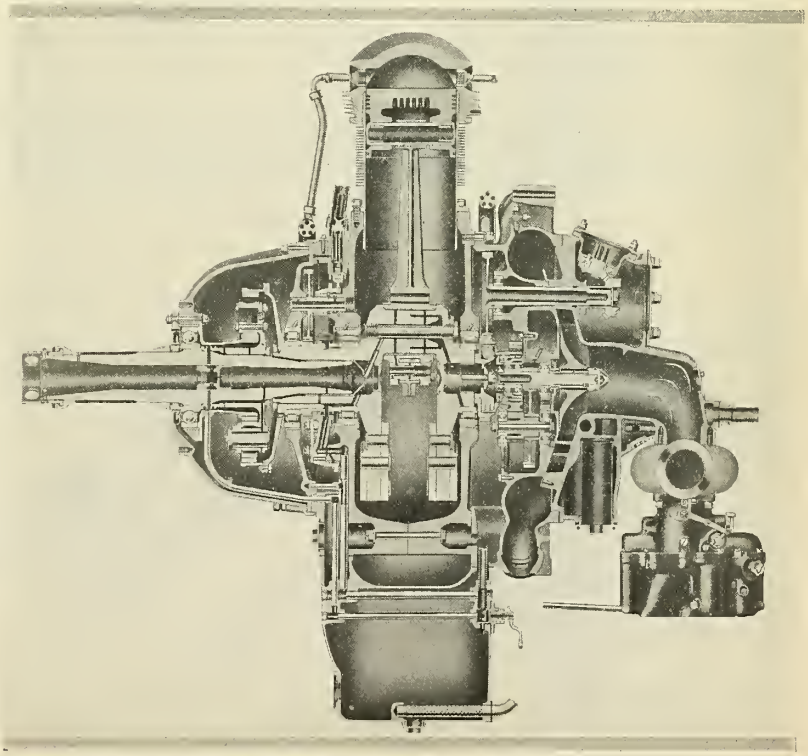
The rear assembly is compact, the various accessories grouped so as to be accessible and to present a clean, balanced appearance. The crankcase nose section, its housing made of heat-treated aluminum alloy, encloses a spur planetary type of propeller reduction gear so designed that all teeth may be ground. A bell gear is attached to the forward end of the crankshaft by means of splines, and the hub of this gear is supported by a roller bearing carried in an aluminum diaphragm mounted on the front section of the crankcase. Six planetary pinions mesh both with the bell gear and with a fixed or sun gear carried in the nose section of the crankcase. These planetary gears are carried in a forged steel cage splined directly to the propeller shaft.

The propeller shaft is a nickle-steel forging, carried on 2 bearings spaced well apart in order to provide ample support for the propeller. The forward bearing, just behind the propeller hub and carried in the nose section, is of the anti-friction type which takes both radial and thrust loads. The rear end of the propeller shaft is carried by a plain bearing mounted inside the forward end of the crankshaft, and bearing surfaces are pressure-lubricated.

Oil from the supply tank passes through the pressure pump and thence through a fine-mesh strainer, accessibly located in the rear section. The oil is then carried into the crankshaft and distributed to the crankpins and rods, reduction gear, cams, cam drives and other moving parts. Oil under pressure also is supplied to the accessory and supercharger drives. An oil by-pass relief valve is provided and so arranged that the relief discharge need not necessarily be returned to the tank, but may be recirculated to the suction side of the pressure pump.

Extra thick flanges are provided on all oil pipes, accessory covers and cover plates to prevent warping and consequent leakage. Moulded rubber inserts between cylinder flanges and the three front engine cases help to contribute towards its oil seal.

The cam revolves on a bronze bearing mounted on a shelf at the front section of the main crankcase. It is driven by a reduction gear at .125 crankshaft speed and in the opposite direction to the crankshaft. Valve tappets, mounted in guides in the front section of the main crankcase directly over the cam track are carried in the same member as the cams.



Longitudinal section showing internal arrangement of the Pratt & Whitney Series H Wasp

Fore and aft views of cylinder units

It is possible to assemble the entire power section and time the valves while the cams and tappets are still exposed to view, the latter being easily removable without disturbing the guides.

The single-throw, two-piece crankshaft of 5% nickle carborizing steel has a stub shaft of increased diameter and is jointed at the center of the pin. The rear section telescopes over the front section and is held in angular position by 31 splines whereas only 16 were used formerly. The increase in the number of splines has given additional strength to a part where great torsional stress is concentrated and has stiffened up this unit changing the torsional period, in addition to allowing a more even distribution of the stresses over the shaft.

The improved spring coupling of the H Wasp has fewer and slightly heavier springs than those previously used. Button heads at each end of each of the 6 springs evenly distribute stress throughout the spring. Mounted between the crankshaft and the supercharger drive, the spring coupling relieves the supercharger drive gears of severe strains due to the sudden acceleration and deceleration of the crankshaft.

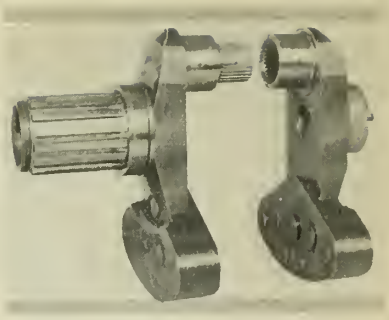
The sheet metal pressure baffle consists of 18 pieces, making it possible to remove any cylinder or group of cylinders without removing all the baffling. Sections between cylinder rocker boxes are firmly fastened to adjacent cylinders. Sections between cylinders are fastened by conventional butterfly plates set between the fins, and the baffle sections are bolted together so that their outer flanges form a ring to which the engine cowl may be attached.

To improve the oil seal each rocker box cover is secured with three stud bolts and lock nuts instead of bail wire clamps. Ends of rocker shafts are made oil tight by the use of gaskets. Slots on the rear spark plug recesses make possible the use of lug-type washer thermo-couples.

Intake and exhaust rockers on the H Wasp are considerably stronger than those on previous models. Drilled for pressure lubrication, they are equipped with improved-type adjusting screws and double-race, single-unit ball bearings. Valve heads are dish shaped to more evenly distribute stresses throughout the valve head. The internally-cooled exhaust valves are sodium filled. Exhaust ports have shrunk-in stainless steel liners for a slip tight joint with exhaust pipes thus eliminating the flange common to previous engine models, and special steel valve seats assist in preventing erosion and promoting much longer valve life.

The control mechanism for the Hamilton Standard controllable-pitch propeller is located on the rear of the sump instead of on the nose section, as in previous models. The arrangement of hydro-control mechanism facilitates the installation of all cockpit connections.

The flat-type hot spot in the induction system consists of a steel tube cast in an aluminum housing through which exhaust gasses are passed to assist in vaporizing and pre-heating the fuel mixture from the carburetor. The steel tube is eliptical in section, affording generous heating area and consequently efficient vaporization.



Split pin crankshaft for geared drive

An automatic oil temperature control valve incorporates a thermostat which allows oil at temperatures below 155° to by-pass around the oil regulator, and when oil reaches a temperature above 170° it passes through a cooler. Oil is thus continually maintained at efficient operating temperatures regardless of the temperature of the surrounding atmosphere. By by-passing the oil around the oil regulator, it can be heated quickly and warming-up time is thereby lessened. The flanged oil inlet thermometer connections provided are more adaptable to installation than the threaded type formerly used.

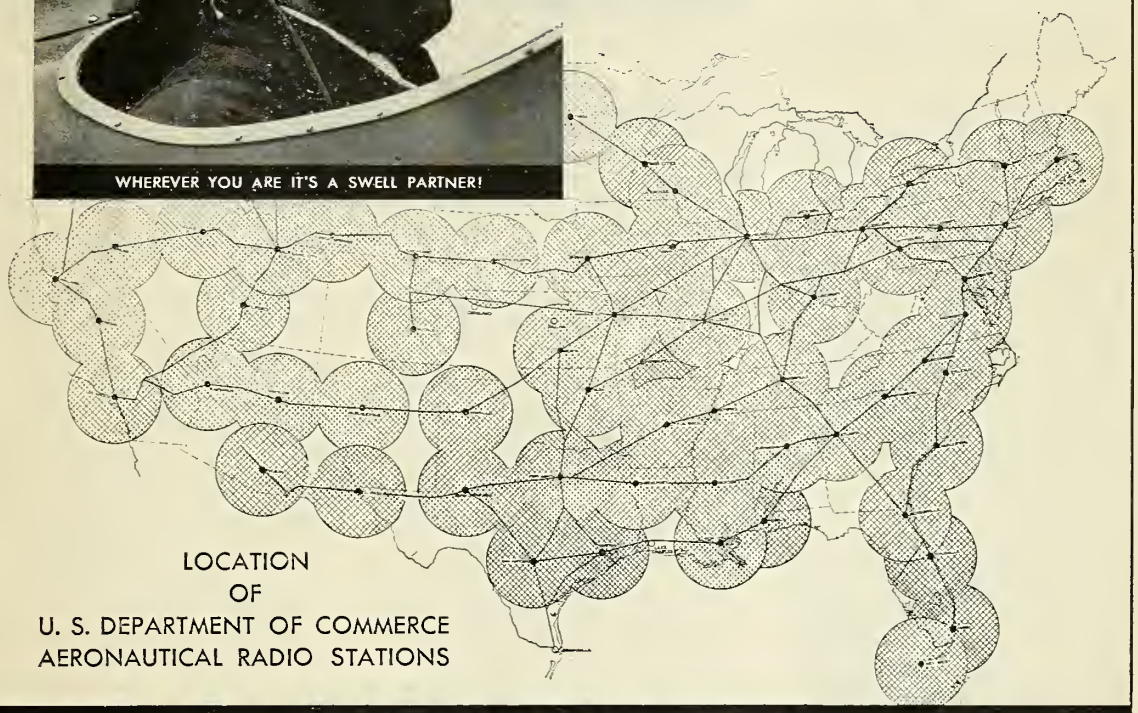
Specifications and full throttle performance of the Series S1H1-G are as follows:

Rating at 2200 r.p.m. (8,000 ft.)	550 h.p.
Bore	5.75 inches
Stroke	5.75 inches
Total displacement	1344 cubic inches
Blower ratio	12:1
Compression ratio	6:1
Propeller gear ratio	3:2
Weight (incl. std. equipment)	918 lbs.
Oil consumption	.035 lb. per h.p./hr.
Fuel con. (cruising)	.48 lb. per h.p./hr.
Fuel specification	Octane value 87
Overall diameter	51.437 inches
Overall length	48.156 inches

Pratt & Whitney S1H1-G engine impeller and supercharger drive, spring coupling (clutch) and power section of direct drive engine

RCA VICTOR
RADIOBEACON RECEIVER

WHEREVER YOU ARE IT'S A SWELL PARTNER!

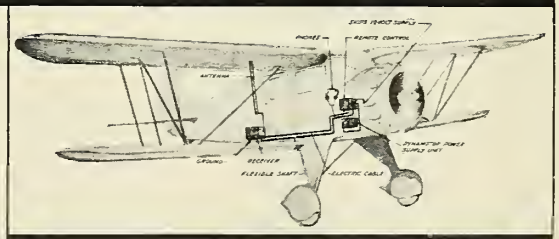


LOCATION
OF
U. S. DEPARTMENT OF COMMERCE
AERONAUTICAL RADIO STATIONS

FOR RADIOBEACON FLYING AND AIRWAYS WEATHER REPORTS

THE new AVR-2 Aircraft Receiver completely covers all the airways radio stations operated by the Department of Commerce and all individual airport traffic control stations. It provides radiobeacon reception, allowing complete use of the radio beam facilities of the country. It covers all weather report stations, and all airport radio stations. For "blind" flying, poor visibility and bad weather conditions, it is invaluable. And it's a real flying pal to help you fly anytime.

This newest Radiobeacon Receiver is designed and manufactured at "Radio Headquarters"—by RCA Victor. It is highly sensitive and highly selective, a SUPERHETERODYNE set created exclusively for aircraft use. It is small, light, and is applicable to any aircraft—for remote or local control installation. Dynamotor power unit supplies all required voltages direct from aircraft 12 or 6 volt storage battery. No dry batteries required.



INSTALLATION WORK ON ANY SHIP IS SIMPLE AND BRIEF

For Information and Demonstration, communicate with:
AIR ASSOCIATES, INC., National Distributors

Roosevelt Field, Garden City Long Island, N. Y.	5300 West 63rd St., Chicago Municipal Airport, Chicago, Ill.	1200 Airway, Grand Central Air Terminal, Glendale, California

RCA VICTOR

RCA VICTOR COMPANY, INC.
Camden, N.J. *"Radio Headquarters"*

(*Continued from preceding page*)
vice hangar, is in the tradition of the GB racers with a large fuselage whose rear portion serves as a vertical fin. It was believed by the late Z. D. Granville that since engine and venturi cowl have to be of large diameter, the maximum cross-section of the fuselage should be even larger for true streamline effect.

The wing is untapered up to the wire supports, and from then on is fully tapered. This interesting ship which is described in this issue of AERO DIGEST, should give a good account of itself in the London-Melbourne Race.

Long-range, high-speed, P. & W.-powered "Q.E.D." entered in the Bendix Race

Freedom from Knock

Val Cronstedt of the Lycoming Manufacturing Co., and John Geisse of the Department of Commerce were in agreement that a notable feature of the races was freedom from knock or detonation (in spite of high compression ratios and highly-geared superchargers) particularly in the powered dives of Army and Navy fliers. When cross-examined as to the miraculous powers of hearing which enabled them to note absence of detonation, they pointed out that it was rather freedom from visible exhaust stack smoke which led to the above inference. Better fuels and improved exhaust valve design were the probable reasons.

Armchair Advice to Racing Pilots

The short laps on the high speed races introduce dangers, but certainly a short lap increases the thrills of watching a race. This is particularly true when standing at the very top of the Press box, from which all four pylons are visible. Cy Caldwell pointed out to us from this position of vantage, that the leading pilot in one or two races flew as if on a railroad track, in an unvariable horizontal plane. Armchair opinion can be given to this pilot (probably Roy Minor) that he was right. If an up-and-down course is flown, more power will be lost in simply overcoming skin friction or profile drag on the substantially longer path. Further, while the pilot is diving he can only extract 100 per cent of the work done by gravity. On climbing, the engine has to provide 100 per cent divided by the propeller efficiency of the work to be done against gravity.

When considering turns around pylons, the problem of correct method is more complex. The general conclusions of some British Reports and Memorandums are as follows:

1. A tight turn is better than a loose turn, but there is no advantage in going to a centrifugal acceleration of over 5*g*.

2. It does not pay either to lose or gain altitude on the turn, although practical considerations may make it advisable to gain a little height on the turn.

3. It is probably best to turn with a constant centrifugal load; that is, to increase incidence by use of the elevator as forward speed is lost in the turn.

4. By bringing the plane almost to a stall from the beginning of the turn it is possible to make the most rapid turn, but there will then be too big a decrease of forward speed—so that average time will be less satisfactory.

In other words, racing pilots should practice moderation, neither turn too tightly nor too loosely; neither zoom up sharply nor lose too much altitude.

Safety

On the well-known principle of locking the hangar door after the airplane has been stolen, it was decided after Doug Davis' tragic accident that a Racing Pilot's Association would in the future inspects ships before a speed dash. While on the subject, it may be useful to point out that mere inspection, however skilled, will not suffice. The crowding of greater engine power in the same ship is a danger against which calculations of stresses alone will guard. The employment of a more powerful engine in the same plane involves only a slight increase in load factor when coming out of a dive (since in the vertical dive the propeller is not pulling, but actually braking). Satisfactory cross-country flying with a more powerful engine is not an assurance of safety, since violent vertical currents may not be encountered. As a rule, engine mounts are so husky that the bigger engine will not apparently affect them. But when it comes to turning around pylons, the greater horsepower will make itself felt. First, owing to the increased speed, there will be a greater variation between the low lift-coefficient of high speed and the maximum lift coefficient of the sharpest possible turn. Second, the greater speed and more powerful slipstream will make the ship more maneuverable. In other words, there are better chances to secure high acceleration loads, and more power for the pilot to bring these loads into being. It should be remembered also that higher speeds always make flutter a more likely possibility.

The Next Year's Racer

There is a limit to air-cooled engine possibilities even if double-row engines are to be put into service. The ideal for a racer (as demonstrated by the Schneider Cup planes) is the smallest possible cross-section of fuselage, but small fuselage cross-section is only utilizable when the frontal area of the engine is small. This inevitably leads back to a water-cooled or chemically-cooled "V" engine, with wing radiator. The Rolls Royce engine of Schneider Trophy race fame points the way with high compression ratios and high r.p.m. Harry Miller, whose reputation in the automobile racing engine field is well established, gave us some interesting notes on this topic. He spoke of a 850 h.p. 12 cylinder "V," with 4,700 r.p.m., geared down, with a frontal area of only 3.5 square feet—the high r.p.m. to be attained by the most refined counterbalancing and special attention to the valve system. Eventually someone will exploit an 18- or 24-cylinder engine in a land racer.

The experience of Weddel-Williams shows apparently that a cantilever job with retractable landing gear turns out to be six miles per hour slower than the thin wing job with external streamline bracing wires. Evidently the thin wing is well worth while. But is it not possible that the use of a *thin* wing, sharply tapered *in plan form only*, with perhaps multiple spars or metal skin would be utilizable with all bracing wires removed.

We have already referred to the possibility of more skillful filleting, greater attention to elimination of interference, cantilever landing gears and numerous other items to achieve better results.

Why not more attention to decreasing weight and hence wing area and overall dimensions? If aerodynamic ideas are scarce, perhaps structural advance will help.

It is often said that land planes can never beat the Italian seaplane record of 440 m.p.h. because seaplanes can be given so much higher loading per square foot. But have lift increase devices been given sufficient attention by the racer designers?

Surely, someone in these United States is capable of turning out a ship which will easily exceed the mark of 400 miles an hour!

Granville, Miller & DeLackner Model R-6H

● Three weeks before the opening of the 1934 National Air Races, Granville, Miller & DeLackner of Springfield, Mass., resumed work on the model R-6H which its owners hoped to enter in the Bendix and Thompson events.

Working as though they were solving a geometric problem that the ship's very name *Q.E.D.* implies, the manufacturers first had to change the lines to accommodate a Pratt & Whitney Hornet SD engine, which has a rating of 675 horsepower at 2050 r.p.m. at 6000 feet. Four days before the initial test hop, the new engine was installed and 19 hours later, Gehlbach left for Los Angeles, stopping in Cleveland the day before the take-off for the Bendix race. After a delayed start, Gehlbach finally got under way, the plane arrived too late to place in the race, but only a short time after the winner in elapsed time. In the light of these happenings, the flight made by Lee Gehlbach foretells a worthy performance by this plane in the forthcoming MacRobertson Race in which it is entered.

The *Q.E.D.* is a commercial descendant of the GB-11, and is designed and built particularly to meet the latest requirements of the Department of Commerce for a "C" license, and to provide the ultimate in a 2-place enclosed cabin sport plane embodying the highest speed consistent with safe landing speed and gas capacity sufficient to allow long-range operation.

Similar to the GB-11 in its 61-inch fuselage diameter, the new job has been lengthened to 27 ft. 2 in., and carries more than twice the wing and horizontal tail area of its predecessor.

The fuselage is of welded chrome molybdenum tubing throughout and features a detachable engine mount. Fairing is obtained by a combination of aluminum over and under the tanks and to the windshield and fabric back to the plywood-covered cantilever fin. Fuel tanks, with accommodations for 400 gallons to give a range of 2400 miles, are slung in the fuselage by padded duralumin straps. A 25-gallon gravity reserve tank together with a 100-gallon tank occupies the bay directly behind the fire wall, while directly ahead of and away from the fire wall, is a 28-gallon tank for oil. The main tank which has space for 275 gallons of fuel, is provided with a powerful dump valve which functions simultaneously with the opening of an air vent at the top of the tank. When empty and closed, the tank is air-tight and can be utilized to provide buoyancy.

Although the wings are similar to racing design, they differ somewhat from conventional practice. The front spar is built up of two closely spaced spruce beams, with the wires pulling from between them to eliminate eccentricity. The rear spar is a single beam with the wires pulling from a heat-treated compression tube which also serves as an aileron hinge.

The airfoil section is a modification of a recent N[illegible] with a tapered [illegible]

added tortion spar behind the hinge spar, and the patented flaps, designed by the late Z. D. Granville, are built into the wing extending from the aileron to the inboard end of each wing panel.

Maple patch plates and steel bushing washers not only provide ample bearing for the wire pull fittings but also strength at the butt fittings. Bolts have fibre bushings to increase their bearing area.

Ribs are of plywood web and spruce cap design, closely spaced and rigidly attached to both spars.

Tail surfaces are all plywood covered, and the entire empennage is full cantilever. The rudder is provided with an adjustable tab; the stabilizer is supported from two widely separated points on the front spar and an adjustable point at the rear spar; and the fin is built on a steel tube framework integral with the fuse[illegible]age. The rudder is a continuation of the [illegible]and is almost 12 inches thick at [illegible]. By a new elevator con[illegible]tem, the stabilizer may be [illegible]ny position while the eleva[illegible] their same relative position [illegible]zer.

[illegible]g gear, with a tread of 76 consisting of 31-inch streams and tires attached to long-[illegible]struts, is equipped with wheel [illegible]ly attached to the landing-gear [illegible] Tension between the landing-[illegible]stresses from side load landings [illegible] by a heat-treated cross tube of [illegible]ed section. A full cantilever [illegible] spring with stellited shoe is

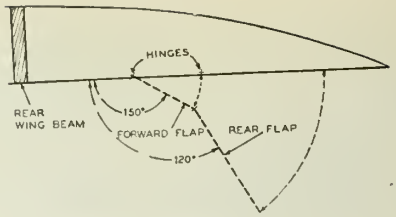
This two-b[illegible]three ball bearings are used sport mod[illegible]but the control system of the every req[illegible] and all control surfaces and con-rich low-[illegible]ts are ball bearing hinged. Ailerons climbs or[illegible]trolled by a torque tube and push-with the [illegible]mbination, elevators entirely by a [illegible]ll system while rudder and brakes [illegible]le controlled. Engine controls are [illegible]ull for spark and throttle, flexible [illegible]or the mixture oil cooler and air [illegible] and torque tube for flap and stabi-[illegible]djustments. Double stainless steel [illegible] wires are employed for both front [illegible]ear flying and landing wires.

[illegible]full NACA cowl, easily remov-

able in two halves, is attached to two supporting rings, one fore and the other aft of the engine cylinders, and the inner cowl has large quickly removable inspection doors. Engine cooling is obtained by the latest pressure-type baffle, with all fresh air intakes being brought through the engine baffle. Two feed the carburetor, another cools the oil tank, another is for an oil radiator while two more provide fresh air to both cockpits. Exhaust air from the inner cowl is drawn out through a venturi in the bottom of the fairing behind the fire wall while navigation venturi tubes are located between the cylinders and through the baffles.

The convertible cockpits are enclosed by shatter-proof pyralin glass at the sides and sliding side windows which can be adjusted and locked to any position. Dual removable controls and positive fuel level gauges are standard equipment and the instrument panel can be equipped with two sets of navigation and engine instruments. Baggage space is provided in three separate compartments and seats and rudder pedals are adjustable. Fresh air flow in the cockpits is controlled by a swinging cover.

Since complete flight tests have not yet been completed, no record of speeds is available. Other specifications of the



Flap arrangement of the "Q.E.D."

Q.E.D. are as follows:

Wing span	34 feet 3 inches
Overall length	27 feet 2 inches
Overall height	9 feet 6 inches
Angle of incidence	2 degrees
Dihedral	4.5 degrees
Fuel capacity	400 gallons
Oil capacity	28 gallons
Empty weight	3144 pounds
Useful load	3356 pounds
Gross weight	6500 pounds
Wing loading	36 lbs./sq. ft.

Areas (square feet)

Wing area	211
Ailerons	21.2
Elevators	15.6
Stabilizer	24.5
Fin	3.7
Rudder	10.5

Digest of Technical Articles from Foreign Publications

ELSA

Propeller Di

The Airplane Propellers. ... the Verification of Blade Resi... Hélices Aériennes. Calcul de ... la résistance des pales), M. W... Générale de L'Aéronautique, ... pp. 24-83, 3 figs.

THE STANDARD proce... Minor) that termining the resistance of ...down course plane propeller blades in l... be lost in cussed and its eventual i... on or profile pointed out. The author an... onger path. infinitesimal forces at a distanc... ing he can tact and of inertia acting on the ... the work of volume and surface, and ... the engine the fundamental elements of red...ided by the the center of gravity of each se...ork to be some of the categories of the i... mal forces reserved. He also gi... id pylons, mulas for elements of total redu... is more the center of gravity of some ...sions of and, for each section, the maxim...orandums forces corresponding to the p... greatest fatigue of the section. ...n a loose cludes a practical procedure giv... in going precise details of operations to p...wer 5*g*. tables to fill in, curves to be dra... lose or points out where the calculations ...gh prac- be inserted in specifications of th...dvisable peller to be presented to the Se... Technique de L'Aéronautique. ... with a ..., to in-

...ce. ...ien standing ...ress box, from ...e visible. Cy... ...es from this ...e leading pilot ...s if on a rail- ...ble horizontal ...can be given

out that mere inspection will not suffice. The crowding engine power in the same ship is against which calculations of ... alone will guard. The employment more powerful engine in the same pl... involves only a slight increase in l... factor when coming out of a dive (sin... in the vertical dive the propeller is ... pulling, but actually braking). Satisfa... tory cross-country flying with a more powerful engine is not an assurance of safety, since violent vertical currents ma... not be encountered. As a rule, engine mounts are so husky that the bigger en... gine will not apparently affect them. B... when it comes to turning around pylon... the greater horsepower will make itself fel... First, owing to the increased speed, the... will be a greater variation between th... low lift-coefficient of high speed and the... maximum lift coefficient of the sharpest... possible turn. Second, the greater speed... and more powerful slipstream will make... the ship more maneuverable. In other... words, there are better chances to secure... high acceleration loads, and more power... for the pilot to bring these loads into... being. It should be remembered also that higher speeds always make flutter a more likely possibility.

The Next Year's Racer

There is a limit to air-cooled engine possibilities even if double-row engines

Aerodynamics

Velocity Field in a Smooth Current of a Compressible Fluid (Campo di velocita in una corrente piana di fluido compressibile). Part II—Case of the Profiles Obtained by Means of Conformal Transformation from the Circle, and in Particular the Joukowski Profile), L. Poggi. L'Aerotecnica, Vol. 14, No. 5, May, 1934, pp. 532-549, 2 figs.

RESULTS FROM the first installment in the December issue (abstracted in the March issue of AERO DIGEST) are applied to profiles obtained by conformal transformation from a circle, the object being to establish the expression for the increase of lift coefficient due to compressibility of the fluid, especially for that of the Joukowski profile. For the case of the infinitely thin Joukowski profile at infinitely small incidence, numerical calculations are given the results of which are in accord with those obtained by Prandtl and Glauert.

Wing Spar Tests

Note on a Method of Representing Spar Tests, H. R. Fisher. (British) Aeronautical Research Committee—Reports and Memoranda No. 1537, February 2, 1933 (published August 21, 1934), 28 pp., 16 figs. on supplementary sheets, 21 tables.

THE REPORTED investigation was undertaken to show that a graphical method, developed by Professor Southwell for representing experimental observations and proving useful in problems of elastic stability, may be applied to the analysis of tests on airplane spars. Experimental confirmation of the theory is obtained from tests on a steel bar within the elastic limit, and results are shown of applying the method to tests in which the elastic limit is exceeded. Below the elastic limit, it was found that approximations of the Berry type make the method applicable to spar tests, provided the deflection is appropriately defined.

Aluminum Castings

Aluminium Castings for Aircraft, N. F. Budgen. Aircraft Engineering, Vol. 6, No. 66, August, 1934, pp. 207-208, 214.

ALUMINUM ALLOYS now used in aircraft-engine parts are discussed with notes on the methods and technique of casting them. The author points out the necessity for careful supervision of the workman who molds and pours the castings and explains why some popular aluminum casting alloys have become obsolete. He concludes with suggestions for the heat treatment, casting and melting of aluminum.

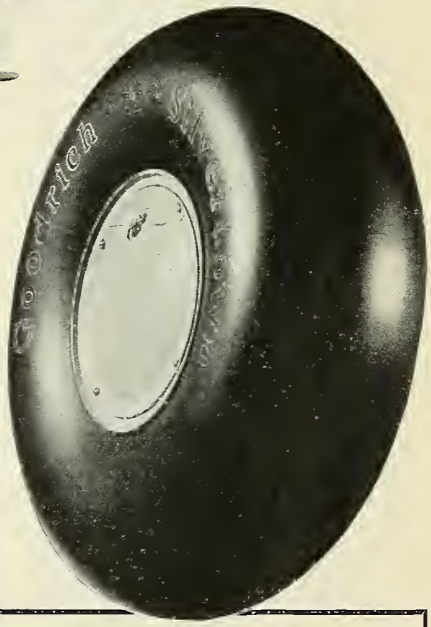
The same issue of the magazine (pp. ... and 214) contains an article by A. G. ...end which gives practical suggestions ... the casting and machining of aluminum alloy pistons.

(*Continued on following page*)

AIRPORT OR PASTURE

Goodrich *Airplane* Silvertowns make Landings Safe!

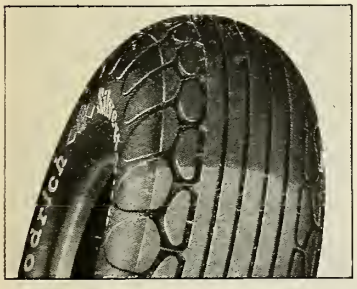
Waco Cabin Model "C"
Top Speed 149 m.p.h.



Waco planes depend on safe, proven performance of Goodrich low-pressure tires

SOARING high over mountain ranges—dropping into short, rough fields . . . Flying low over parched deserts—landing in sand and cactus . . . Racing across the countryside—slipping into any meadow with care-free ease. Waco airplanes go anywhere—land anywhere—smoothly, surely, safely—for the Waco Aircraft Company equips all models with Goodrich Airplane Silvertowns.

Whether you fly light sport planes or fast coast-to-coast transports, insist on the proven dependability and safety of Goodrich Airplane Silvertowns for quick, sure take-offs and smooth, easy landings.



See your nearest Goodrich dealer or write Dept. 445, Aeronautical Division, of the B. F. Goodrich Company, Akron, O., for complete information about Goodrich Airplane Products.

Whenever you fly, look at the tires. See how many times you take off on Goodrich Airplane Silvertowns

GOODRICH-EQUIPPED WACO "D"

This two-hundred-mile-an-hour Waco super sport model carries complete equipment for every requirement. And landing on Goodrich low-pressure tires, it drops into—and climbs out of—so-called impossible places with the utmost ease and safety.

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes—including Tires—Tail Wheels—Abrasion Shoes—De-Icers—Matting—Rubber Hose—Grommets—Shock Absorber Cord—A Complete line of Rubber Aeronautical Accessories.

(*Continued from preceding page*)

Fuel Research

Research on the Constituents of Petroleums and Gas Oils. Tests Established by a Quantitative Method of Analysis. (*Recherches sur les constituants des "pétroles" et des "gasoils"*), *E. Carrière and H. Bonnet. Publications Scientifiques et Techniques du Ministère de l'Air, Service des Recherches de L'Aéronautique, No.* 43, 1934, 32 *pp.*, 4 *figs.*

A SIMPLE method is established for proportioning the types of carbons which can be found in petroleums and gas oils. In regard to the petroleums, the authors have indicated two methods, the first based on the use of mean densities at 20° of acyclic and cyclic saturated carbons in function of the boiling point, and the second based on the use of factors of mean refraction of these carbons. The aromatic carbons are proportioned by means of the index of nitration and the proportion of benzenic carbons to the naphthalenic and polybenzenic carbons results from the determination of the density of the niter product. With reference to the gas oils, the authors describe a method based on the employment of the mean densities at 20° of the acyclic and cyclic saturated carbons in functions of the boiling point. These methods are a generalization of those proposed by E. Carrière and R. Lautie for the proportioning of gasoline.

Aileron Tests

Aileron Angles in High Speed Manoeuvres with Single Seater Fighters, B. V. Williams and J. H. Hartley. (*British*) *Aeronautical Research Committee—Reports and Memoranda No.* 1582, *September* 11, 1933 (*published August* 2, 1934), 8 *pp.*, 6 *figs.*

FULL-SCALE experiments were made to investigate aileron movements in two single-seater fighters during high-speed maneuvers in order to provide data for the revision of strength requirements. It was found that the ailerons of the first airplane were so heavy that full aileron could not be applied at top level speed whereas at high speed in the dive with engine throttled only a small movement of the ailerons could be obtained. On the second airplane full aileron appeared to be applied seldom at top level speed or higher speeds, but it might be possible with the use of abnormal force. A considerable amount of aileron could, however, be used at speeds well in excess of top level speed when diving with engine throttled.

Formed Metal Tests

A Study of Tests for Formed Metals (*Etude sur les essais d'emboutissage des métaux*), *H. Fournier. Publications Scientifiques et Techniques du Ministère de l'Air, No.* 44, 1934, 33 *pp.*, 25 *figs.*; *also* 41 *tables and* 12 *plates on supplementary sheets.*

THE NEW method developed by Siebel and Pomp at the Kaiser-Wilhelm Institute for testing formed sheet metal is studied and compared with methods developed by Persoz and Erichsen as well as with tension tests. The tests are applied to the study of various sheet metals in different states. Tables are included which indicate the influence of thermal and mechanical treatment on the results of these tests and cover ordinary semi-hard steel, stainless steel, brass, aluminum and treated and annealed duralumin. The author concludes that each test has its particular applications. The K.W.I. method is suitable for the qualification of sheet metals of large elongation and would be equally interesting for calculating a small decrease in the properties produced, as for example, increase in the size of the grain or corrosion. The Persoz and Erichsen tests would be preferable for the qualification of metals of small elongation and for the study of variations of properties in functions of treatment. The results of tension tests are interesting for the study of metal working, but are applied to relatively thick sheets.

Manometer

An Improved Multitube Tilting Manometer, R. Warden (*British*) *Aeronautical Research Committee—Reports and Memoranda* 1572, *November*, 1933. (*Published April*, 1934.) 6 *pp.*, 3 *figs.*

A NEW model multitube tilting manometer designed to overcome the disadvantages of the older models is described. Precautions were taken in the design and manufacture of the instrument to eliminate any danger of trouble due to distortion. The table assemblage rotates about a pin and is roughly balanced about its axis of rotation. The measuring tubes are matched and calibration factors for individual tubes are not required. A method of setting the table is described whereby the actual observations are the values of the standard coefficients ($P/\rho V^2$). A system of indirect lighting which gives a bright meniscus and scale against a dark background and eliminates parallax errors and eyestrain is incorporated. A sensitivity and accuracy equivalent to that of a 26-inch Chattock gauge has been achieved. (*Continued on p.* 52)

Bellanca "Irish Swoop" Racer

● The Bellanca low-wing racer, the *Irish Swoop*, built especially for Col. James Fitzmaurice, Irish pilot, features high speed and long range, attributes necessary for a ship entered in the forthcoming MacRobertson Races from England to Australia.

Powered by a Pratt & Whitney Twin-Wasp Junior two-row engine developing 700 horsepower, and equipped with a Hamilton Standard controllable-pitch propeller, the plane is expected to attain a top speed of 275 miles an hour and cruise at approximately 240 miles an hour. Provisions have been made to carry 650 gallons of fuel, in a tank located between the cockpit and fire wall, and estimated to give a range of from 2500 to 2800 miles at cruising speed.

The 46-foot wing follows conventional Bellanca design and, like the fuselage, is constructed of wood and covered with fabric. The cockpit provides a tandem seating arrangement and dual controls for Col. Fitzmaurice and his co-pilot. Among the instruments carried are a Sperry directional gyro and a visual and aural radio direction finder. The convertible cockpit is enclosed with a sliding, three-section transparent hood having an arrangement at the side of the front seat to enable complete and quick opening of the top.

The retractable tubular steel landing gear, with a tread of 12 feet 6 inches, folds inward into the wings. Tail surfaces are of fabric-covered wood construction. The tail wheel is non-swivelable. Two streamlined cabane struts, each with a clearance of 18 inches, are used below the fuselage for attachment of the streamline flying wires.

Complete performance figures are not available for publication before the race.

Martin-Eckert photo

P.&W. Twin Wasp Junior-powered Bellanca Racer with cowling removed

NICHOLAS-BEAZLEY

Here is one undeniable fact:

WINTER IS "JUST AROUND THE CORNER"

IN selecting our line of winter wearing apparel for the 1934-1935 season we have constantly endeavored to offer our customers the very MOST for the very LEAST. We present now a well-rounded line which makes it possible for every pilot to have the maximum flying comfort at prices well within his reach. It is impossible to determine accurately in advance the real demand; consequently allow us to suggest that you anticipate your requirements and Order Early, While the Stock is Complete and YOUR SIZE IS ON HAND FOR IMMEDIATE SHIPMENT.

NB-40 FLYING SUIT

Soft Brown All Leather

Mohair pile fabric lined. Full Zippered front, sleeves, legs. Big Laskin lamb fur collar. Sizes 36 to 48.

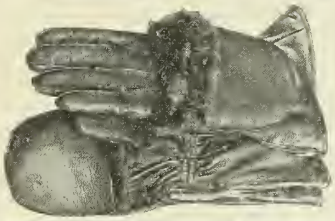
NB-40, $49.00

NB-13 LAMBSKIN LINED HELMET

Cordovan chocolate leather. Very warm lambskin lining.

NB-13 HELMET $3.00

(Write for quotations on other winter helmets.)



SPECIFICATION GLOVE MITTENS

Air Service specification. Zipper cuff, fur-lined pouch. Very warm. Pouch snaps back.

GLOVE, WITH POUCH.....$12.50
GLOVE, WITHOUT POUCH.... 8.00

(Write for quotations on other winter gloves.)

DRYFOOT MOCCASINS

Rubber soles, genuine leather uppers. Heavy sheepskin lining, full Zipper front. Worn without, or over, regular shoes.

PER PAIR.....$8.50

NB-50 FLYING SUIT

Extra Heavy Sheep Lined

Waterproofed Bedford cord. Zippered front, sleeves, legs. Large Beaverized sheep collar. Exceedingly warm. Sizes 36 to 48.

NB-50, $32.50

NICHOLAS - BEAZLEY AIRPLANE CO., INC.

IN THE EAST
Floyd Bennett Field
Brooklyn, N. Y.

IN THE CENTRAL STATES
Home Office:
Marshall, Missouri

IN THE WEST
6235 No. San Fernando Rd.
Glendale, Calif.

NICHOLAS-BEAZLEY

Basic Design Features of the Pan American Sikorsky Model S-42 Airplane

(Concluded from the September issue)

H. A. FRANCHIMONT

Aircraft Engineer, Pan American Airways, Inc.

While this is the concluding chapter on the above subject, the writer does not claim that the description or discussion are by any means complete. However, it is hoped that these articles may give an idea of some of the paramount thoughts which governed the realization of an airplane which departs from the old school in respect to efficiency, economy and earning power. The following notes may also be considered an introduction to the basic structural necessities for economical airplane design in general.

● The structure of the wing is of the conventional type in its general layout; that is, of the 2-spar type in which both spars are interconnected by compression ribs. In the S-40, the chord members of the spars are of the type shown in figure A, having flat sides. As flat plates in compression are not as strong as curved plates, use is made of this law of nature and a curved cross section (figure B) adopted for the chord member. Such a curved section is just as easy to manufacture as one with flat sides, for both are extruded aluminum alloy sections. Web members between the upper and lower chord members are connected to them by means of gusset plates and bolted with self-locking nuts. The writer, however, suggested the use of chord members having integral gusset plates (as in figure C) which eliminate about 33% of the bolts and nuts at the points where web members are attached. A good portion of the gusset plate area is also eliminated, lightening the structure besides giving greater stiffness. The unused portion of the integral plate between attachment points is then easily cut away from the chord members. The web members, which have an I section with lightening holes in the web, may be built lighter, giving them more even buckling strength about their major axes. Subsequent airplanes of modern design will have this type of construction with integral gusset plates. In fact, the writer has always found it highly desirable to employ methods of construction in which the number of separate joints is reduced to a minimum and replaced by integral joints, even to the extent that entire members are made of one and the same body material.

The fundamental principle of economical structural design, i.e., achieving ultimate strength while using a minimum of matter (or, in other words, obtaining a high strength/weight ratio) is obtainable first by selecting materials which in themselves have a high strength/weight ratio, and then so distributing them that their cooperation insures a high strength/weight ratio. This distribution of matter in its final state is usually referred to as the structure. Here, as anywhere else, the right material must be used in its right place. Tensile loads are easily taken care of, but compressive, buckling, crippling, bending and torsional loads create difficulties which must be promptly counteracted by proper structures. Since these loads use leverage in their destructive action, they must be counteracted also by leverages. One of the favorable elements of airplane design is that leverage is distance and distance weighs nothing. As the strength of a structure is a function of the strength of the material used and the leverage on which it acts, it follows that light structure can only be made by the application of widely distributed matter, so as to increase its leverage.

Nature itself indicates this principle by supplying the frame of animal life with closed hollow tubular sections which, in aircraft design, find their counterparts in tubular struts and similar structures. The distance between the materials used in aircraft construction cannot indefinitely grow because wall and sheet thicknesses become impractically thin and crinkle. By curving or corrugating the material this can be overcome if the distances are not too great.

Based on these principles, the proper thing to do is distribute the material, thus arriving at a wing with stressed skin. This principle cannot be escaped and the quicker we put this into practice the better it will be for all concerned, airlines and manufacturers alike. Because they want to stay in business and be self-supporting, we must have and deliver efficient aircraft. Here the aerodynamical qualities and the structural qualities of aircraft go hand in hand, and both are expressed mainly by two simple ratios: a high lift over drag (L/D) ratio for cruising at ever higher speeds, and a high strength over weight ratio. Both of these are favored by a high wing loading, of which mention was made in last month's installment of this article.

Sections of wing spar members

The structural principles above explained are to be applied for all component members of an airplane—wing, tail, hull, fuselage, engine mounts, landing gear, beaching gear, external bracing, etc., but in the latter case care should be taken to minimize the strife between aerodynamic and structural efficiency, indicating that these two items enter in direct conflict with each other as soon as we start to take our structure outside of the boundary of the otherwise closed bodies. It is up to the ability and ingenuity of the aerodynamist and stress analyst (who are actually the prime designers of a plane) to arrive at the ultimate combination which will allow the highest possible payload, which payload is dominated by the combination of the least possible fuel consumption and the least possible structural weight.

For instance, in the case of a huge plane of the practically all-flying-wing type, in which an L/D ratio of about 20 or more may be obtainable, an additional pound of drag may be expressed as being equivalent to about 20 pounds of additional structural weight. This shows that it might be better to add some 15 pounds of weight rather than to increase the drag by one pound. It also shows that the less the aircraft is refined (that is, mainly, the less the value of the L/D) the less will be the unfavorable influence of adding drag by exposed structure. But our aim is to obtain even higher efficiencies, hence exposed structural members will have an ever-increasing unfavorable influence on this efficiency. The best that can be done, then, is to crowd the structure as much as practical to the boundary, and keep the exceptional cases of exposed structure to a strict minimum.

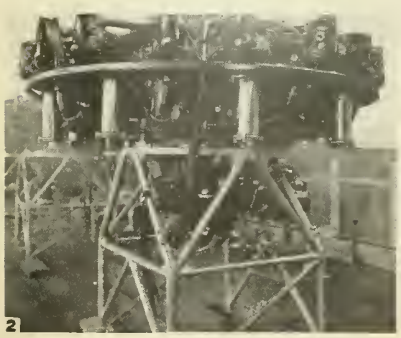
The principle of letting the boundary and the skin of airplane parts carry the load was probably first expressed to a large extent in the creation of the monocoque type of fuselage during the war and subsequently in flying boat hulls. In regard to boat hulls, it is

(*Continued on following page*)

(*Continued from preceding page*)

quite possible today to build them without high keels. A keel member brings material nearer to the center of the cross section of the hull, which is undesirable. Longitudinal stringers or a corrugated skin on the bottom and roof are more logical means of obtaining the required strength, while the bulkheads former frames will maintain the shape of the hull and give it the required transverse stiffness.

As for the drag of these bodies, much improvement will be made in the direct future. The general tendency has been to decrease the cross section of fuselages and boats as much as practically possible (taking into consideration other requirements, such as take-offs for boats) for fear that the head resistance is practically entirely dominated by the cross section of these containers. This however, is by no means true, as was shown by the aerodynamical experiments of George Eiffel in his laboratory at Paris some 24 years ago, when it was revealed that for a more or less streamline body of the Zeppelin dirigible type of those days, skin friction represented about 80% of the total drag. This being so, the cross section plays rather a minor role in the drag of a streamline body of a length which is excessive compared to its cross-sectional dimensions. This gives an indication of the usefulness of stubier fuselages and boats, which, when their length is predetermined by such requirements as tail distance, will allow for larger cross sections, resulting in more inside roominess, comfort and pay load capacity. This principle has been demonstrated by the Gee Bee racers the fuselages of which are short compared with their cross sectional dimensions. However it is paramount that the fuselage, or boat or float, be considered purely as a streamline form and their lines calculated as such. No straight lines in the fore-aft direction should appear on them, except, of course, on the bottoms of flying water-craft, where hydrodynamical requirements for take-off and landing must be fulfilled. In this case it is possible to combine a low drag boat, fuselage, etc., which allows a high value of L/D of the entire airplane and still give spaceousness and luxurious comfort.



Engine mount of the Sikorsky S-42

This desirable condition can be further increased by quietness, and, on this account, the airplane must be vibration and sound proof. The first step in this respect is to prevent, to as great an extent as possible, the creation of vibrations at their source—the power plant, comprising the engines and propellers. The creation of these vibrations can not be entirely prevented, notwithstanding the increase in the number of engine cylinders and the use of three-bladed propellers. The engine mount itself has to be solidly built.

Comparatively, a rock does not vibrate, but a spring does. The following experiment, to show how vibration is transmitted, may easily be made in an ordinary office chair having arm rests composed of vertical and horizontal members. Lean with your back against the back of the chair and tap with your fingernails against the ends of the arm rests, first in a plane containing the two members, and then horizontally at the sides of the arm rests. It will be observed that the first tapping, (in which the arm rest members are submitted to axial loads) results in almost negligible vibration, but the horizontal taps, (in which the members are loaded in bending) cause a pronounced vibration to be transmitted to the back.

This simple demonstration shows that to keep undesirable vibration out of the structure the quickly-variable loads in an engine mount (created by the rapid torque variation of the engine) must be taken up by axial loads in the structural members of the engine mount, and that the variable bending loads must be avoided. The rule is then that the tangent to the engine mounting at the apex of any two structural members must be in the plane of these members. In such a case there is no component at right angles to the plane of these members, which component would subject the members to undesirable variable bending which creates vibration. Instead, these members are loaded by axial forces to which they are very solid.

Preferably, at least 4 points of attachment should be located on the engine ring, equally spaced so as to have two triangles in two vertical planes and two triangles in two horizontal planes. Experience has shown this idea to be correct and it is, therefore, possible to select a type of construction which is sound in preference to one of the vibrational types.

In this respect also the S-42 is of sound construction and in all the test flights that the writer was aboard the plane (and he missed not one, beginning with the manufacturer's demonstration flight), he enjoyed the remarkable sturdiness and solidity of this giant airliner.

Digest of Foreign Technical Articles

(*Continued from page* 48)

Airport Design

A Design for an Air Port, H. G. Cousins. Aircraft Engineering, Vol. 6, *Nos.* 65 *and* 66, *July and August,* 1934, *pp.* 193-196 *and* 220-223, 6 *figs.*

THE DESIGN described was awarded the 1934 Charles Hawksley Prize by the Institution of Civil Engineers and is intended to provide customs facilities and hangars for all types of aircraft from sport planes to the largest types of airliners. The author discusses the choice and planning of the site, clearance and preparation, drainage of storm water and subsoil, and adopts the Duval system for planning the airport buildings. The first article concludes with details of the terminal building, while the second is devoted to the hangars, covering the doors, workshops, lighting, heating and ventilation, fire fighting, and gasoline supply as well as the estimated cost of such a project.

Wing Coverings

Bending of a Beam with Thin Metal Covering (La flessione delle travi con piastra sottile), P. Cicala. Atti della Reale Accademia delle Scienze di Torino, Vol. 69, *No.* 12, 1933-34, *pp.* 171-187, 4 *figs.*

IN DISCUSSING the bending of cantilever beams with thin metal coverings, such as used in airplane wings, the author analyzes the case in which the corrugated metal may be capable of supporting only the tensile stress. Introducing the hypothesis that the corrugations are parallel, he determines the development of stresses in the beam and the ideal thickness of the metal in order that, bending solidly with the beam, it may carry its share of the bending equal to what the metal may effectively support. He derives an expression for the work of deformation and for the inclination of the corrugations, with respect to the axis of the beam, at which the work is a minimum.

Airplane Structures

The Dynamic Stresses in Aeronautical Construction (Le azioni dinamiche nelle costruzioni aeronautiche), G. Guidi. L'Aerotecnica, Vol. 14, *No.* 6, *June,* 1934, *pp.* 671-685, 3 *figs.*

AN EXPERIMENTAL procedure is discussed for reproducing on an isolated element of an airplane structure the repeated static and dynamic stresses to which the element is subjected when at rest and in flight. The author also suggests a method by which the capacity for resistence of an isolated element in a structure may be analyzed and verifies the fact that it offers the desired margin of safety.

St. Louis Unit Gets Recognition

RATING AS second best naval reserve air base in the United States was awarded the U. S. Naval Reserve Air Base located at St. Louis, according to an official report received by Lieut. T. B. Williamson, base commander. There are approximately 20 naval reserve air bases in the country.

The Navy department rates the stations on the ability of the men to handle their planes under all conditions including accuracy in dive bombing, in radio communication between the ships and the ground and for drill attendance.

The enlisted men were examined and the air base inspected in June by a board from the Bureau of Aeronautics.

Foreign Officers Take Courses

WHEN THE fall term of the U. S. Army Corps tactical school at Montgomery, Ala., opened last month, it was found that four foreign students were enrolled through the courtesy of the U. S. Government. They are: Capt. Ziya and Capt. Tevfik of Turkey and Lieut. Ricardo L. Castenada and Javier Gonzalez of Mexico.

ZMC-2 In Service Five Years

AUGUST 19, marked the fifth anniversary of the launching of the Navy's metalclad, ZMC-2, at the Grosse Ile Airport, Detroit, Mich.

During this period the ZMC-2 has been almost continuously in operation as a training and experimental ship assigned to the U. S. Naval Air Station, Lakehurst, N. J., and has flown approximately 50,000 miles during her 1,100 hours in the air.

Built by the Metalclad Airship Corp., Detroit, Mich., the ZMC-2 is the first successful airship with the hull, including the hull covering itself, built entirely of metal.

Alclad, a strong aluminum alloy, now in general use in most types of aircraft construction, was employed commercially for the first time in the building of the ZMC-2.

Midshipmen Visit Langley

TO FURTHER familiarize themselves with naval aviation, members of the first class of midshipmen at the Naval Academy made the first visit ever made by Naval Cadets to the Langley Memorial Laboratories at Langley Field, Va. The visit was accomplished when their practice squadron, the U. S. S. *Arkansas* and *Wyoming*, was in Hampton Roads.

NOEL DAVIS TROPHY AWARDED TO VN-6R

THE NOEL DAVIS Trophy, presented annually for the highest efficiency in the Fleet Reserve Aviation Division was awarded to VN Squadron 6R, Naval Air Station, Anacostia, D. C. Lieut. M. M. Cloukey, commanding officer of the unit, received the trophy from Rear Admiral J. R. Defrees, commandant of the Navy Yard, while Rear Admiral Ernest J. King, Commander A. E. Montgomery and Lieut. Comdr. W. K. Harrill looked on during the ceremonies.

First Lady Asked to Sponsor Carrier

SECRETARY OF the Navy Swanson has invited Mrs. Franklin D. Roosevelt to sponsor the aircraft carrier CV-6, to be named the U.S.S. *Enterprise*. The ship is now under construction at Newport News and no date has been set for the launching, which will occur early next year.

The *Enterprise* is of 20,000-ton displacement. Her keel was laid on July 16, 1934 and on September 1, she was reported as being 12.7 per cent complete. The contract date set for her completion is February 3, 1937.

This will be the sixth vessel to bear the name *Enterprise*.

Harms Commands Randolph Field

ORDERS WERE issued in Washington designating Maj. Henry W. Harms as commandant of the Air Corps Primary Training School at Randolph Field, San Antonio, Tex., succeeding Lieut. Col. Frederick I. Martin, who has been transferred to the War College at Washington. Maj. Harms has been acting as assistant commandant of the school. Maj. Lloyd N. Keesling, now on leave in Virginia, has been appointed assistant commandant.

Brig. Gen. James E. Chaney, former commander of Kelly Field, who has been assigned to command the air corps training center to succeed Col. Charles H. Danforth, is expected to leave Washington shortly for San Antonio to assume his new duties.

TC-14 Undergoing Tests

THE TC-14, largest semi-rigid airship in the world, will be sent to Scott Field, near Belleville, Ill., soon from Hammandsport, N. Y., where it was built and is undergoing test flights.

The airship will be used for scouting and observation training work during the winter months and it will be shipped to Scott Field by rail and remain until next April.

The TC-14 has a new-type control gear for semi-rigid airships and attains a speed of 80 miles an hour. It is 245 feet long and 50 feet wide at its longest and widest points, with a helium-gas capacity of 400,000 cubic feet.

Its observation car can accommodate a crew of 16, is 43 feet long and 20 feet wide. On the sides of this car are slots for machine guns. The dirigible is propelled by two 300-horsepower engines and an auxiliary engine of 125 horsepower.

Burwell Commands Air Unit

MAJOR HARVEY S. Burwell, for the past two years stationed at the General Staff and Command School, Fort Leavenworth, from which he was graduated, is now at Omaha, where he has assumed the post of air officer of the Seventh Corps Army Area. He succeeds Major H. J. Houghland, transferred to Langley Field, Va.

Randolph Chapel Dedicated

IMPRESSIVE DEDICATION ceremonies in which Col. Alva J. Brasted, chief chaplain of the United States Army, took part, were held at the new $55,000 chapel at Randolph Field, San Antonio, Tex., September 2. Col. Brasted flew to San Antonio from Washington in a plane piloted by Col. Jacob E. Finkel. Guests of honor at the dedication ceremony included Mrs. Cornelia Randolph, widow of the late Capt. William M. Randolph, for whom the field was named.

Carrier Planes Train

INITIAL MANEUVERS of a two-month training course got under-way at Philadelphia when 36 bombing planes were ordered there from the aircraft carriers *Saratoga* and *Lexington*. The planes are practising defensive and offensive measures, going out to the Delaware Breakwater to bomb targets.


CHANCE-VOUGHT
CORPORATION
EAST HARTFORD
CONNECTICUT
SUBSIDIARY OF THE UNITED AIRCRAFT CORPORATION

Boston University Gives Air Course

THE MAJOR importance of aeronautics in the fields of transportation, communication and manufacture, and indications of a need for broad training for the many young men who will presently be drafted into this industry have caused the inauguration of a department of aeronautics in Boston University's college of business administration. Hilding Carlson, professor in the college of business administration, will be the head of the new department, according to Dr. Daniel L. Marsh, president of the University, and Dean Everett W. Lord.

This course is designed to provide practical and technical phases of airplane design, manufacture, operation and administration. In order to secure adequate training in all of the phases leading to the proper induction into the aeronautical industry, the University has arranged a curriculum in cooperation with the Boston Aeronautical Institute and Wentworth Institute. At present Massachusetts Institute of Technology is the only other New England institution offering a complete course in aeronautical engineering.

Recognizing that an academic training alone is insufficient, this course offers two summer sessions of six weeks each, given at the Boston Airport, where students are trained in the practical phases of airplane and airplane engines, overhaul, maintenance and repair.

McMenamin In South America

DAVID McMENAMIN, of the Rising Sun Aircraft School, Inc., Philadelphia, Pa., sailed recently for Rio de Janerio, where he will take up his new duties as manager of one of the largest airports and aircraft factories in South America.

Previous to his departure, McMenamin was chief instructor in Autogiro Mechanics for the Rising Sun School.

College Adds Aeronautics Course

A COURSE in aeronautics has been added to the curriculum of the Engineering School of the Rhode Island State College. According to the president's announcement, Igor Sikorsky, who has been lecturing at the college for a number of years on various subjects connected with aviation, will conduct the course.

Purdue's Field Ready for Use

THE NEW airport at Purdue University, West Lafayette, Ind., which is to serve both as a commercial port and as a training field for the aviation department of the university, has been formally opened, and Captain L. J. Aretz, of the 113th Observation Squadron, has been named superintendent. The city of Lafayette has closed the old Shambaugh airport.

Service will be maintained day and night, and the port is equipped with the latest developments in lighting and in shop arrangements.

RECORD ENROLLMENT IN ENGINEERING COURSE

THE POPULARITY of the Aeronautical Engineering course at the University of Cincinnati's College of Engineering and Commerce is attested by the record enrollment of Freshman students this year, estimated as more than 25 per cent over last year. The course is for five years on the co-operative system. Students, after the first semester, spend seven weeks in school and seven weeks in some correlative work chosen by the University. Major Bradley Jones, professor of aeronautics, is head of the department.

Parachute School Organized

GENE ROCK, veteran parachute jumper, is to establish a training course for parachute packers and jumpers at the Paul Baer municipal airport, Fort Wayne, Ind. Rock was licensed in August by the Bureau of Aeronautics of the Department of Commerce as a parachute packer, and plans to conduct an approved and licensed institution.

Wind Tunnel For Parks

PARKS AIR College has added to its equipment a three foot, open-throat, return passage wind tunnel, now being constructed. The tunnel will cover a surface of 22 feet by 14 feet and will be used for aerodynamic research work and for studying drag. The results of the experiments performed by the engineering students will be used to design lightplanes. Complete blue prints will be made and one plane from each set will be constructed in the shops by the students of the school.

Large Student Group in Lakeland

TWENTY-SIX students are now taking flying instruction with Raymond Aircraft Co., Lakeland, Fla., under the direction of William H. DaBoll.

The company, owned by Wesley Raymond, is Florida and Georgia distributor for Kinner aircraft and maintains three Birds, two Aeroncas and a well equipped shop and servicing facilities at the local municipal airport.

An Aero Club has been formed by the students and its roster now includes about 40 members.

Ryan Adds Radio Equipment

NEW FLIGHT radio equipment for use of its transport students has recently been installed at the Ryan School of Aeronautics, San Diego, Calif. The sets combine the latest developments for aerial control and enable the student not only to receive voice directions from the ground, but also instruction in radio beam flying. Conditions at Ryan are well-suited for this training inasmuch as a radio beam station is on the north end of Lindbergh Field which enables the students to fly the beam and also determine their position from the cone of silence, thereby simulating the conditions encountered when approaching an overcast field. This training is in addition to and is later combined with the blind flying instruction which is also included in the regular training of transport students.

Paul Wilcox, flight instructor and formerly chief test pilot for Continental Motor, has rejoined the Ryan faculty.

Webber Added to Parks Faculty

PARKS AIR College now has as a member of its faculty Douglas H. Webber, who has left his position as Chief Engineer for Rearwin Airplanes, Inc., where he helped complete the design of the new Rearwin Speedster. He will teach in the Aeronautical Engineering School.

N. Y. U. Resumes Air Courses

EIGHT COURSES in aviation for pilots and ground school teachers, temporarily suspended for the summer vacation, are again being offered at New York University, School of Education, New York, N. Y., under the direction of Roland H. Spaulding. They cover aircraft, engines, instruments, meteorology, navigation, aeronautic education and research.

Bureau Approves Two Schools

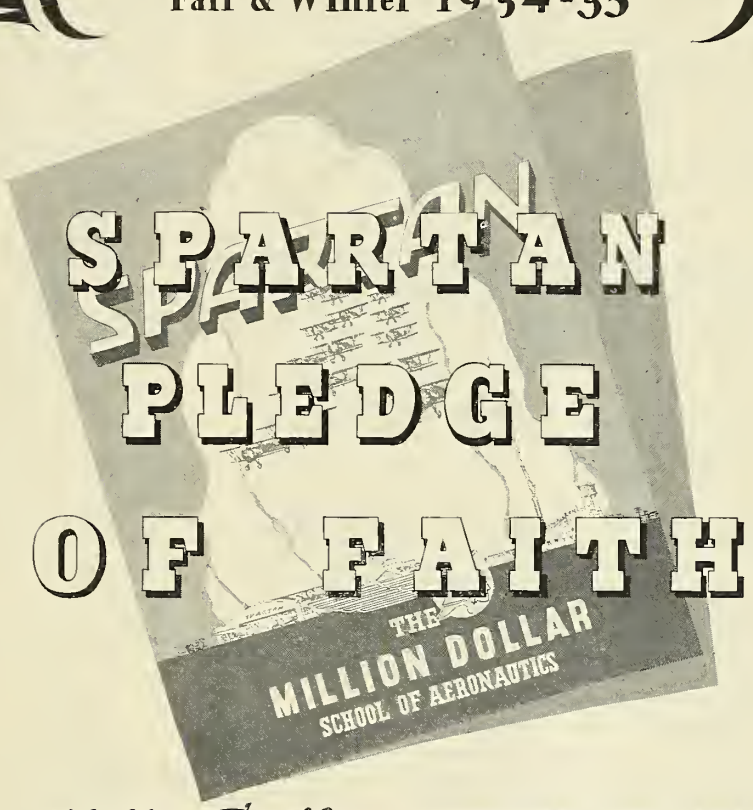
APPROVED SCHOOL certificates were issued by the Department of Commerce to Erickson & Remmert, Floyd Bennett Field, Brooklyn, New York and Muncie Aviation Corp., Muncie, Ind. The former has approval as a private and amateur pilot ground and flying school (in conjunction with New York University's ground school) while the latter has been sanctioned as a limited commercial, private and amateur ground and flying school.

Operator Prepares For Busy Season

MAX A. CONRAD, Jr., transport pilot and president of Conrad Flying Service, Inc., Winona, Minn., is looking forward to another busy season for his school as a result of a greater desire in this section to learn to fly. At present, 27 students are enrolled in the school.

THE NEW SPARTAN CATALOG

Fall & Winter 1934-35



SPARTAN PLEDGE OF FAITH

Only a Million Dollar School Could Make it!

Ta YOU considering a Future in Aviation it is vitally necessary that yau knaw the type af training yau will receive at the schaal yau select, haw lang it will take, what it will cast and what your living expenses while in schaal will be. When you are considering a SPARTAN 3 STAR★★★ Caurse of Aeranautics the answers far all these questians are fully answered in detail in the new SPARTAN Catalog — aver 50 pages profusely illustrated af Spartan OWNED equipment anly. It is the pledge af faith that anly a MILLION DOLLAR INSTITUTION CAN MAKE. Send far yaur FREE copy taday.

FLY WITH THE 13 DAWN PATROL

SPARTAN SCHOOL OF AERONAUTICS
P. O. BOX 2649, TULSA, OKLAHOMA

GENTLEMEN: Send me a copy of the NEW 1934 Spartan Catalog and Supplement describing in detail Spartan 3★★★ STAR Courses of Aeronautics, tuition prices and detailed living expenses:

NAME_____

ADDRESS_____

CITY_____ STATE_____

AGE_____ Any Previous Flying Experience?_____

Check below branch of aeronautics you are most interested in:

- ☐ FLYING
- ☐ MECHANICAL
- ☐ RADIO-INSTRUMENT
- ☐ EXECUTIVE-MANAGEMENT

AT THE AIRPORTS

Repair Station Approvals Issued

THREE FIXED base operators and one transport company were issued approved repair station certificates by the Bureau of Air Commerce, Department of Commerce, as follows:

Southern Airways, Inc., Daniel Field, Augusta, Ga., for wood structure (excluding box type and laminated wing spars).

August Graf, Canaan, Conn., for welded steel tube box structure, wood structure excluding box and laminated spars, fabric covering, steel fittings, assembly.

New England Aircraft School, Boston Airport, E. Boston, Mass., for welded steel tube structure, wood structure excluding box and laminated spars, fabric covering, steel fittings, assembly.

Pacific Seaboard Air Lines, Inc., Memphis, Tenn., for welded steel tube structure, wood structure excluding box and laminated spars, fabric covering, steel fittings, assembly, instrument overhaul and repair.

Airport At Anamosa Started

WORK HAS been started in converting the fairground adjoining Anamosa, Ia., into an airport. On the site, which includes the old fairground and five additional acres, two runways, each more than 200 feet wide, will be built sufficiently long to provide adequate landing or take off space for any type plane.

Work Started On La Crosse Airport

WORK HAS been started on French Island near La Crosse, Wis., to reconvert Pfafflin airport into a field which meets specifications of the Department of Commerce. Under the proposed project, the field will be marked by board markers as an outline for the port. A 100-foot circle, designating the landing field, will be constructed, and the field will be graded and two runways built. The runways will be 300 feet wide by 2,800 feet long. A wind indicator will also be erected.

TEN AIRPORTS RECEIVE ENTRY DESIGNATION

THE FOLLOWING airports have been redesignated temporary airports of entry for a period of one year: Juneau Airport, Juneau and Ketchikan Airport, Ketchikan, Alaska; Municipal Airport, Detroit and Municipal Airport, Sault Ste. Marie, Mich.; Marine Airport, Buffalo and Seaplane Base, Rouses Point, N. Y.; Municipal Airport, Burlington and Missisquoi Airport, Swanton, Vt.; Municipal Airport, Crosby, N. D., and Municipal Airport, Port Townsend, Wash.

36 Michigan Ports Being Completed

WORK HAS been resumed on 36 of Michigan's airport development projects financed out of Federal Relief Funds, and they may be completed in a few months, according to officials of the State Board of Aeronautics, who said adequate funds are available for the completion of the work.

Aeronautics Board officials are urging local authorities to complete the transfer of airport projects to the FERA rolls as rapidly as possible and eight other projects are scheduled to start soon. These are located in Owosso, Bellaire, Northport, Hillman, Frankfort, Coldwater, Harrison and Niles.

View of Meacham Field, Fort Worth, showing layout of runways

Airliners On Display At Airport

EVERY CLASS of high-speed commercial air transport regularly using Grand Central Air Terminal, Glendale, Calif., was on display there when the airport recently observed "open house." T.W.A. had in line its new Douglas 14-passenger plane and its new Northrop Gamma, mail and express carrier; American Airlines showed its Curtiss-Wright Condor sleeper and its Vultee transport and Central Airways of Mexico displayed two types of Lockheeds—the new Electra and the Orion.

Representatives of the airlines and pilots were on hand to explain the details of the different airliners to the public which was admitted free of charge.

Approximately fifty passes for flights in the several types of transports were provided in connection with the display.

Aereco Flying Service Sold

AERECO FLYING Service, of Fort Wayne, Ind., has been sold to a group of local operators headed by Bernard Lloyd, well-known Fort Wayne pilot, and will be reorganized and continued in operation from the Paul Baer municipal airport there. Sale of the service was negotiated in August.

O. B. McVey will be instructor-pilot under the new organization and Ward Hall will be in the service department.

Mishawaka Airport Opens

A NEW landing field has been laid out at the southern edge of Mishawaka, Ind., and efforts are under way for the installation of further improvements.

Flyers from the Bendix Municipal port at South Bend took part in an air show to dedicate the field, and to stimulate civic interest in it. The plot consists of 106 acres of level land, and is under contract to the H. & H. Flying Service, a new unit organized by E. R. Humphrey and M. L. Hatfield.

Meacham Field Runways

DURING THE recent improvement of Meacham Field, Fort Worth, Tex., a portion of the original runway plans for the project was carried through to completion.

The original plan called for four runways: one running north-south for 4,000 feet; another, northwest-southeast, 4,000 feet; a third, east-west, 3,800 feet and a fourth, northeast-southwest, 3,900 feet. At present, the field has 2,500 feet in its north-south runway, 2,900 feet in its northwest-southeast runway and 900 feet in its east-west runway.

The work was accomplished by the City Street Department under the supervision of D. C. Lipscomb, Superintendent of Streets.

Marshall Field Being Improved

THE AIRPORT improvement project at Marshall, Minn., launched last winter, is to be carried through to completion this fall. Completion of the proposed work will give the field one east-west runway, 600 feet wide and half a mile long, while the north-south runway will be 300 feet wide and a half mile long. A short runway will be run across the intersection of the two runways, making it possible for planes to land from nearly any direction. The proposed work also entails adequate marking for the field, including panel markers at 200-foot intervals around the airport.

Sheldon Airport Dedicated

THE SHELDON Aeronautics Club, Sheldon, Ia., sponsored a two-day air show at the city airport, September 8 and 9, in conjunction with dedication ceremonies for the new airport. Many aviators from Iowa and neighboring states took part in the circus which consisted of parachute jumping, stunt flying, ribbon cutting contests and speed races.

Idabel Airport Draws Commendation

THE NEW airport in Idabel, Oklahoma, consists of 160 acres, with two runways, each one hundred feet wide. Circle markers have been installed, a wind cone has been built and a new fence completely surrounds the property. State and national officials have complimented city officials for the completeness of the field in this small city.

18 New Airports Established

ACCORDING TO information received by the Bureau of Air Commerce, 18 cities have established or completed improvements of airports in the past month. These include projects in Dotham, Ala.; Little Rock, Ark.; Lakeland, Fla.; Columbus and Savannah, Ga.; Davenport, Ia.; Norwood, Mass.; Flint, Mich.; Three Forks, Mont.; Beach Bismarck and Devils Lake, N. D.; Scranton, Pa.; Providence and Smithfield, R. I.; Memphis, Tenn.; Beaumont, Tex.; and Cody, Wyo.

Operator in New Quarters

STINSON AIR Cab Service, operated by John H. Shobe at the Boston Airport, East Boston, Mass., has moved to the American Airways hangar on the same field, offering student instruction, charter and passenger service, with two Stinsons and an Aeronca. A. C. Leichsheid is now with the company as pilot.

Weather Observer Contracts Awarded

ALTITUDE FLIGHTS for the purpose of obtaining first-hand information for accurate weather reports, will be made by George R. Lockhart, Cheyenne, Wyo., and Harry B. Sidles, Billings, Mont., following the award of contracts for the work.

The contracts are for one year and will end July, 1935. The pilots measure the depth of cold and warm air currents over their territory as an aid in forecasting the weather.

Niezer Heads Flying Service

LOUIS NIEZER has been selected general manager and secretary-treasurer of the Aereco Flying Service, Paul Baer Municipal field, Fort Wayne, Indiana, succeeding Capt. Clarence F. Cornish who became airport manager. Charles Hull is the new operations manager.

Airport Managers Elect Armstrong

FULCHER ARMSTRONG of Wichita Falls, was elected president of the Texas Association of Airport Managers at their convention in Corpus Christi. S. W. Ruff of Austin was elected vice-president and C. W. Maus, Corpus Christi, secretary-treasurer. Austin was selected as the next convention city.

Mississippi Airport Nears Completion

THE McCOMB, Miss., airport now under construction will be dedicated October 6, according to Clifford Rawls, head of the aviation committee of the local Chamber of Commerce.

Fuel and Oil Prices Reduced

REDUCTION IN the cost of gasoline and oil furnished both to resident and transient planes was announced by the Board of Aviation Commissioners of Fort Wayne, Ind., operating the Paul Baer Municipal Airport there. The commission also authorized the establishment of a municipal ground school, to be taught by Capt. Clarence Cornish, airport manager.

Under the new prices, fuel is reduced to local airplane operators, from 23 to 21 cents per gallon; or to 19 cents when purchases exceed 300 gallons per month. For transient planes, the gasoline price is reduced from 28 cents to 25 cents. Oil to local operators is reduced from 35 cents to 30 cents per quart; and to transient planes, from $1.40 to $1.30 per gallon.

More Airport Funds Sought

PLANS WHICH will result in obtaining $40,000 in additional funds for completing work on 43 airports in Oklahoma are being completed by Herbert Howell, federal Oklahoma airport engineer. The work will consist of marking and draining the airports other than those in Oklahoma City and Tulsa. Twenty-five of the ports are completed except for this work, while additional construction is necessary on 18 others.

New Airport Licensing Point

BLACK HILLS airport, the new project at Spearfish, S. D., is to serve as licensing station for pilots and planes of the Black Hills section of South Dakota, according to Lester G. Orcutt, Department of Commerce inspector in that territory. Monthly inspections formerly were held at Rapid City and Belle Fourche, but the Spearfish location was decided upon because it is centrally located and because of its hangar and flying facilities.

Tulsa Seeks ATA Rating

WHEN PRESENT improvements on the Tulsa, Okla., municipal airport are completed, the field will be eligible for an ATA rating, according to Charles W. Short, airport manager who said that plans call for the installation of panel markers at the runway, boundary markers, and improvements to the north and south runways to facilitate night operations and repainting of the center circle on the field.

Joplin Gets New Manager

H. B. HARPER, formerly manager of Myers Field, Carthage, Mo., has been appointed manager of the Joplin, Mo., municipal airport by the local city officials. He has moved his planes and equipment to his new field and plans to operate a taxi and school service. All buildings on the field that were not municipal property, have been leased to him.

OHIO PLANS EXTENSIVE AIR MARKER CAMPAIGN

LOOKING TOWARD retaining its reputation of being the best air-marked state in the nation, Ohio has begun distribution of $8,000 worth of yellow and black paint for the painting of more than 1000 air markers.

Grand Central Enlarged

SEVERAL ACRES have been added to the runways at the northwest end of Grand Central Air Terminal, Glendale, Calif., by moving back the airport fence to space formerly occupied for parking automobiles. At the other end of the main runway, the city is filling in 20 acres of land formerly used as an earth-dump so that both pieces of property will allow for lengthening the airport more than 1000 feet.

The city also proposes to eliminate the high voltage poles around the port.

Kentucky Airport Opens

FOLLOWING THE formal opening of the new Williamsburg, Ky., airport, the Williamsburg Flying Service leased the field and is offering hangar, fuel and oil facilities. Officers of the company are K. D. Gatliff, J. G. Locklin and Charles Rising.

The field is two miles from the city, lies on a direct line between Lexington, Ky., and Knoxville, Tenn., and at present is housing four planes.

Fixed Base Operator Organizes

GRAND NATIONAL Air Lines has been organized in Manning, Iowa with W. E. Stoelk, president, Lawren Stoelk, vice-president and H. J. Darnley, secretary-treasurer.

The company plans to purchase and develop a tract of land into an airport from which they propose to operate a complete fixed base service including school, service and charter flight activities.

Zanesville Airport Dedicated

THE MUNICIPAL airport at Zanesville, Ohio was dedicated with an impressive air show which featured acrobatic flying by Art Davis, Harold Neumann, Lt. J. Mackey and Chuck Smith. Delayed parachute jumps by Clem Sohn and Taylor Mast also were featured on the program.

Speakers included Capt. Fred L. Smith, director of aeronautics of Ohio and Major H. A. Kern, while Bill Sweet was at the microphone.

Smaller Lights Allowed On Ports

SMALLER AND less expensively-operated lamps may be used in the boundary lighting systems of fields having or seeking Department of Commerce ratings, according to a new amendment to the airport rating regulations promulgated to encourage more airports to operate their boundary lighting systems throughout the night. The use of these smaller lamps will reduce operating expenses and should help encourage more extensive operation of the field lighting systems at various airports.

Under the amendment, for multiple circuits, lamps of not less than 15 watts shall be used for clear and yellow lights, and lamps of not less than 25 watts are to be used in green and red lights. On clear and yellow lights, in series circuits, lamps of at least 250 lumens are required and on green and red lights, the lamps shall be of at least 400 lumens. Prior to the new ruling, lamps of not less than 25 and 50 watts and 600 and 1000 lumens were required by the regulators.

Improvements For Hillsgrove Field

WORK IS soon to be started on the construction of concrete runways at the Rhode Island State Airport, Hillsgrove and more than $400,000 is to be spent for further improvements to the drainage system and terrain there.

High-tension wires and poles formerly lining the road opposite the entrance to the field have been moved back 50 feet.

Tennessee Plans Airport Program

CONSTRUCTION OF 28 airports is being planned by officials of the Tennessee Emergency Relief Funds Association with state and national linking-routes of sufficient magnitude to stamp the state third in the south in the mileage and airports available.

At Memphis, a fence almost 1000 feet long has been built at the apron in front of American Airways' hangar, while Pacific Seaboard Air Lines, Inc., has brought a large amount of equipment there to facilitate its air mail, passenger and express business.

Fire Causes Loss At Love Field

DAMAGE ESTIMATED at $30,000 was done at Love Field, Dallas recently when fire destroyed Hangar No. 4 which contained three planes, a machine shop and supply house.

The hangar was owned by C. G. Killinsworth, while the planes were the property of private fliers.

Kenosha Renews Port Lease

FOLLOWING THE recommendation of the Harbor Commision, the Kenosha, Wis. City Council has renewed for another year its municipal airport lease.

Tourists to Fly In Pennsylvania

THE DIVISION of Aeronautics of the Commonwealth of Pennsylvania is sponsoring a three-day State Air Tour, the first official tour to be conducted within that state. The itinerary calls for a visit to 18 airports with the participants leaving the Harrisburg Airport October 12, and winding up at the Allegheny County Municipal Airport, Pittsburgh, Pennsylvania, on October 14. Forty entries have been practically assured at present and it is planned to limit the number to 50.

The purpose of the tour is to create interest in aviation and to show those participating the facilities for handling air traffic.

Two-Day Meet At Lunken Airport

A PROGRAM of stunting and parachute jumping opened a two-day air meet as part of the Southern Ohio Aircraft Exhibition at Lunken Airport, Cincinnati, Ohio. The feature of the second day was a handicap Mystery Derby Race. Each pilot was given a card having on it the location of an airport to which he was to fly to receive further directions. The course was a 300-mile circle taking in Vandalia, Columbus, Chillicothe, and Springfield. Russell A. Moore, flying a Great Lakes, won first place.

The 359th Observation Squadron, which is based on the field, put on a program of stunt and formation flying, and a number of civilian flyers also performed. The director of the meet was E. J. Burkhardt assisted by T. Gile, A. Wunder, F. Fairchild and S. Huffman.

99ers Conduct Tour and Show

TWENTY-FIVE representatives of the southern California division of the 99ers made a two-day flight from Los Angeles to San Diego and return, as part of an All Women's Air Tour. A public dinner dance in their honor was sponsored by the aviation committee of the San Diego Chamber of Commerce and the Junior Chamber, and the pilots staged an air show at Lindbergh Field before 12,000 people. Ethel Sheehy put her Great Lakes plane through an aerobatic exhibition; Grace Prescott won the 20-mile race while Clemma Granger won the spot landing contest and Gladys O'Donnel took first place in bombing.

10,000 See Legion Show

WITH A crowd of nearly 10,000 in attendance, Oklahoma pilots and an army squadron went through five hours of exhibition work at the Oklahoma City municipal air terminal September 2. The 15 new-type army planes, from Shreveport, La., flew to Oklahoma City for the American Legion Convention. They performed tight formation flights over the airport to open the show, sponsored by Oklahoma City merchants. Bud Meyers and Cliff Giblett tied for first place in the looping contests, each completing 13 loops in two minutes. Perry Mullins was third with 12 loops.

FITZMAURICE RECEIVES MEDAL OF HONOR

THE MEDAL of Honor of the International League des Aviateurs, was awarded to Col. James Fitzmaurice, Irish aviator who flew the Atlantic in 1929. Col. Charles Kerwood, president of the American section of the league made the presentation.

Tour of Kansas Scheduled

THE 1934 air tour of Kansas will start October 3 and continue until October 6, according to officials of the Wichita Aviation Club and the Exchange Club, sponsors. Plans call for about 15 stops at some of the state's leading cities, three overnight stops and an airshow in Wichita on October 7.

Forty planes are expected to make the 1000-mile jaunt.

Beloit Legion Sponsors Show

AN AIR show in Beloit, Wisc., sponsored by the local unit of the American Legion, drew close to 6,000 persons. The events were managed and announced by Jim Ewing.

Among the participants were Wayne Wagener, Clem Sohn, Roger Don Rae and Mickey Efferson, parachute jumpers, and Capt. Richard Granere who staged a "crazy flight." One free-for-all speed race over a 15-mile course was won by Art Davis and the other by Roy Hunt.

Visitors included Orrie M. Young, Department of Commerce inspector.

Aero Club Organized

THE RICHLAND Aero Club was recently organized in Mansfield, Ohio, with C. R. Martin, president; Robert Andrews, vice-president; Harry Russell, secretary-treasurer; and Dale Stewart, assistant secretary-treasurer. There are four members of the board and five members, in addition to the officers. Membership is being restricted to 25.

A plane has been purchased and Lieut. E. L. Parcell retained as instructor. Dual and solo flights are given to members at small cost, and it is expected that another ship will be purchased soon.

The club operates from both the municipal airport in Mansfield and the Andrews Airport in Selby.

46 Planes in Indiana Tour

THE SIXTH Annual Indiana Air tour, sponsored by the Aircrafts Trades Association and conducted during the week of September 10, was participated in by 46 planes, carrying nearly 100 persons. The tour, far exceeding in interest any previously held, brought a vision of commercial aviation to many of the new ports opened during the present summer in the state of Indiana.

Ships and aviators from many parts of the state took part. Rain somewhat hampered the activities at South Bend and Fort Wayne, and prevented the ships from landing at the new port of Winamac.

Lieut. Stanton G. Smith, commander of Schoen field at Fort Benjamin Harrison, acted as field marshall. Charles E. Cox, Jr., president of the Aircraft Trades Association; Walker W. Winslow, chairman of the tour committee; Herbert O. Fisher, secretary of the association; managers of many of the airports of the state, and many private flyers were in the flight.

Jimmie Mattern joined the tour and stayed throughout the week. Local airports enjoyed stunting exhibitions by Mike Murphy and parachute work by Gene Rock. At South Bend and Fort Wayne, the municipal aviation commissions and the chambers of commerce tendered banquets for the visitors. Overnight stops were made at Seymour, French Lick, South Bend, Lake Wawasee, Fort Wayne and Muncie.

Independent Operators Move

MAIN OFFICES of the Independent Aviation Operators of the United States have been moved from St. Louis, Mo., to 420 Transportation Bldg., Washington, D. C.

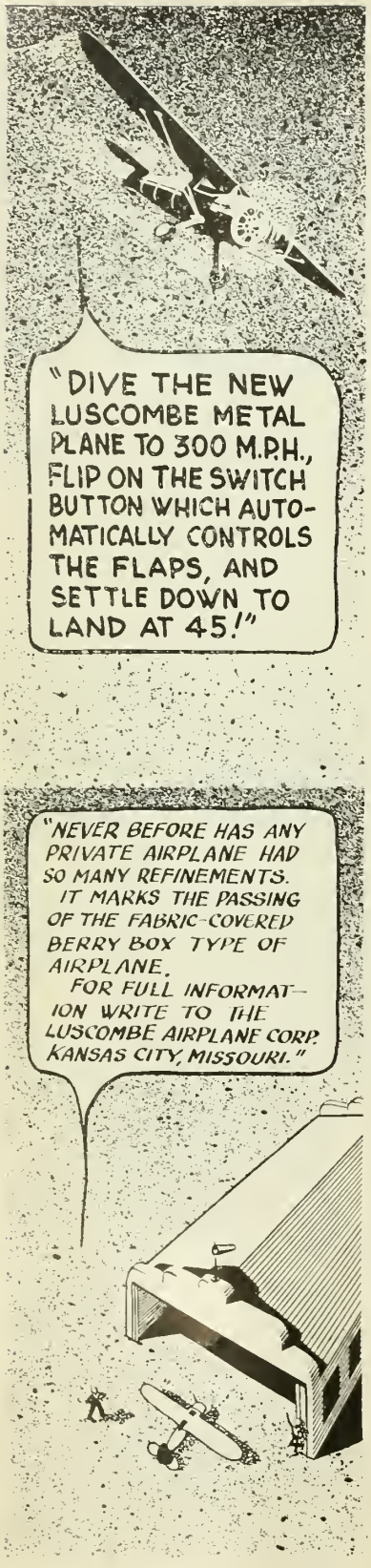
The chairmanship of the National Advisory Committee of the Association has been accepted by Bernarr Macfadden who is expected to participate in the program to develop private flying and commercial aviation activities.

The association, according to Oliver L. Parks, president, now numbers 1,400 members, consisting of airport operators, flying school operators, repair stations, sales agencies and private fliers.

New Haven Meet To Be Held

TWO RACES and four other events will feature the air show October 7 at the New Haven, Conn., Municipal Airport, according to Jack Tweed, manager.

Cash and other awards will be presented to the winners of the first three places in the bomb dropping, barrier landing, paper strafing and acrobatics contests, as well as the light plane and handicap races. In addition, cash prizes will be awarded for attendance, the winners being chosen by a drawing.



Ohio Group Forms Club

THE MIAMI Valley Aviation Club has been organized and incorporated at the Municipal Airport, Dayton, Ohio, with thirty-five charter members. Clubrooms have been leased at the airport.

Officers are: L. H. Rhein, president; Orvil Denlinger, vice-president; Roger K. Powell, secretary-treasurer, and Howard Mayes, Jr., James Isabel, Elwood Heister, Harry Brown and R. H. Satterfield, trustees.

The club aims to promote aviation in the Miami Valley.

Patterson Heads Civic Committee

MOSS PATTERSON, president of the Oklahoma City Aviation Club, has been named chairman of the Oklahoma City Chamber of Commerce aviation committee. Patterson takes over the duties of Clarence Page, who has been acting as chairman since the resignation of H. C. Martin recently. Activities of the committee, Patterson said, will include pushing the lighting of an air route from St. Louis to Los Angeles through Oklahoma City and Wichita Falls, Tex., and to Little Rock, Ark., and trying to get government aeronautical offices to locate in Oklahoma City.

Glider Clubs Active

INFORMATION FROM the Soaring Society of America, Elmira, N. Y., indicates an increasing interest in the sport of gliding and soaring.

The Associated Glider Clubs of New Jersey held their first meet last month at Lyons, N. J., where the "Y" Flying Club took first honors for groups. The events, limited to primary and secondary gliders, included spot landing, duration and bomb dropping contests.

Plans for activities this fall are being worked out by the recently reorganized South Shore Glider Club of Scituate, Mass. Under Ward Swift's instruction, this group originated the idea of a fixed primary mounted on a ball and socket. It is a practical method for instructing learners and beginners.

Women To Stage Air Meet

THE WASHINGTON Women Pilots Association is sponsoring an All Women's Air Meet to be held October 14 at College Park Airport, Washington, D. C.

Preceding the meet, there will be a reception and gathering of the middle eastern section of the 99ers on October 13, a party given by Mr. and Mrs. C. H. Worthington and a dinner-dance at the Hotel Roosevelt.

The events the following day will include a spot landing contest, a 25-mile handicap race, an acrobatic contest and parachute jumps. A buffet dinner will conclude the two-day gathering.

Flying Club Incorporated

THE HARFORD Flying Club, Inc., Bel Air, Md., has been organized and chartered to promote aviation and operate an airplane flying service in Bel Air and Harford county. Capitalization consists of 100 shares of stock, of no par value. The organizers and incorporators are Russell Noonan, George N. Clendaniel and Harry S. Carver, Jr.

Brewer Contacts Accounts By Air

THE KREUGER Brewing Co., Newark, N. J., has been using the facilities of Richmond Air Transport in conducting its sales campaign in the south.

Chief Pilot G. V. Freiburger has flown a Ryan monoplane on numerous trips through their territory, carrying Robert Decker, brewery distributor, to most of the cities in the south.

12 Women Make Air Tour

TWELVE WOMEN flyers, members of the Associated Women Pilots of Boeing Field, made an air trip to Portland in group formation, with Miss Cora Sterling, president of the chapter, leading the procession.

Among those in the party were Mary Riddle, Quinalt Indian, accompanied by Miss Mildred Filz, Miss Floy Beagle, carrying Juanita Mosey, Grace Listman, Mrs. Dorris Skinner, Gladys Vickers and Edna Barrie.

South Bend Commission Named

A NEW municipal aviation commission has been appointed by Mayor Hinkle of South Bend, Ind., consisting of Karl L. Hermann, president of the Bantam Ball Bearing Co., as chairman, F. A. Hurcomb of the Studebaker Corp., and Dr. Waldo C. Farnham who was a medical officer in the aviation division in the World War.

Low-Rate Rides Offered

FLIGHTS OVER the city of Baltimore, Md., were being offered for 40 cents through the sponsorship of a local jeweler and with the cooperation of the Thompson Flying Service at the Curtiss-Wright Airport there.

The rides were available at 40 cents during the morning hours and from then on there was a graduated scale for each hour, the increase being 10 cents until $1 was reached.

30,000 See Air Show

AN AERIAL carnival at the Curtiss-Wright, Milwaukee, Wis., airport attracted 30,000 persons who saw Harold C. Westphal and S. J. Whitman win the 25- and 30-mile races, respectively.

The meet was sponsored by the Associated Aviation Corp., and was attended by Roscoe Turner, Jack Wise, R. C. Granere, Jr., Jack Miller, Charles Abel, Art Chester and Buck Leighton.

Pilots To Fly 1000 Hours Yearly

NEW REGULATIONS governing the length of time first pilots shall fly on scheduled air transport routes have been put into effect by the Department of Commerce following a conference with representatives of the operators, the pilots and the Aero Medical Association.

In the future, pilots will be required to fly 1000 hours per year maximum, but they may fly 100 hours per month, provided this schedule is not followed for more than four consecutive months.

Physical examinations by physicians designated as Airline Pilot Medical Examiners will be given every three months instead of every six months to determine fitness, with special attention to fatigue.

Eugene Vidal, Director of Air Commerce, said that a complete and thorough study of the matter and of accident records had been made and that there was no case of flying fatigue, even under the old regulations allowing 110 hours per month. However, with the reduced hours and the quarterly examinations, he said, any question of overwork is satisfactorily regulated. The medical examiners to be designated by the Department will be selected at the airline terminals by Dr. R. E. Whitehead, chief of the medical section of the Bureau.

Director Vidal said that the Bureau's connection with the matter of maximum flying hours is concerned solely with public safety and has nothing whatever to do with labor and personnel problems, Congress having authorized the Department of Commerce to regulate the airlines from the standpoint of safety.

Operator Moves to New Quarters

DELTA AIRLINES, Inc., of Monroe, La., holders of the Dallas-Charleston mail contract, have taken quarters in the building formerly occupied by American Airlines at Love Field, Dallas. R. K. Spalding, formerly with American Airlines, is in charge of the Dallas office. The line formerly used the Bowen passenger depot.

Tyler, Texas, is now an air mail stop on the company's route following inauguration of service September 1.

AIRLINES CARRIED 46,171 PASSENGERS IN JULY

TWENTY-ONE OF the twenty-two airlines operating in the United States in July carried 46,171 passengers, according to the Bureau of Air Commerce. These lines flew 4,051,676 miles, carried 166,605 pounds of express and flew 17,954,542 passenger miles. Compared with the same month a year ago express was the only item to register an increase, passenger traffic falling off 15,333. At that time however, twenty-seven operators were flying passengers.

Braniff Seeks Equipment

PLANS FOR adding new equipment to the Braniff Airways, Inc., mail contract holder on the Dallas-Chicago division, probably will be completed in the near future. The line, reported to be anxious to add night passenger schedules to its mail run, has been making a search for suitable additional equipment.

Bowen Connects For Mexico City

BOWEN AIR Lines, Inc., is now operating a direct 27-hour passenger and express service from St. Louis to Mexico City. Passengers depart from St. Louis at 11:10 a.m. daily and arrive in Mexico City the following day. Transfer to Pan American Airways ships is made at Brownsville, Texas.

One of the new Boeing 247-Ds with geared Wasps and three-bladed propellers

Faster Coast-to-Coast Schedule Seen

COMMENTING UPON the record of 204.6 miles per hour averaged during a non-stop flight from Seattle to Los Angeles, and a Los Angeles-New York cruising speed of 189 miles an hour, established by a Boeing 247-D transport flown by Colonel Roscoe Turner and Clyde Pangborn, officials of United Air Lines state that a material reduction in the company's present 18¾-hour California-New York schedule will result from the acquisition this autumn of ten new 247-D Boeings and the subsequent change to geared engines of its present fleet to conform with the new type.

Major distinction between the two models is in power plants, the 247-Ds being equipped with geared supercharged Pratt & Whitney Wasp Series H engines (described in another section of this issue of AERO DIGEST), and three-bladed Hamilton Standard controllable-pitch propellers. The 247s have direct-drive Wasps with two-bladed controllables.

Following their flight down the Pacific Coast, Turner and Pangborn flew to New York. They completed the 2305-mile flight to Pittsburgh, where unfavorable weather grounded them, in 12 hours 10 minutes, including a 20-minute refueling stop at Wichita, for an overall average cruising speed of 189 miles per hour. Turner said that the flight to Pittsburgh was at normal propeller revolutions because he was observing gasoline consumption of the engines at cruising speed, gathering data for the MacRobertson Races.

United Air Lines stated that the only difference between the Turner 247-D and the planes which the air transport company is receiving from Boeing Airplane Company, is that Turner's plane had been equipped with special gasoline tanks to accommodate 1150 gallons. In all other respects, the Boeing for the London-Melbourne race is identical with the 274-Ds which are being delivered to United Air Lines.

New Passenger Service Planned

JUST AS soon as another emergency landing field is completed, daily passenger service over the 323-mile New Orleans-Houston airway will be inaugurated by Robertson Airplane Service Co., St. Louis.

Mail and express service over the route began on July 25, and stops are made at Baton Rouge, Lake Charles and Beaumont.

The westbound plane leaves New Orleans at 12:45 p.m., arriving in Houston at 4 p.m.; the eastbound plane departs at 9:40 a.m., and arrives in New Orleans at 1 p.m., connecting with a plane serving Atlanta, Washington and New York.

796,950 Miles Flown Per Accident

ACCORDING TO an investigation by the Bureau of Air Commerce, American-operated air passenger lines flew 796,950 miles per accident during the first six months of 1934 when there were 27 accidents in 21,517,658 miles of flying. Six of the accidents resulted in fatal injury to pilots or passengers, and 29 persons were involved. Passenger miles flown per passenger fatality were 5,848,223.

A year ago for the same period, the airlines had 48 accidents in 25,862,120 miles of flying, making the miles flown per accident for the 1933 period 538,794. There were 5 fatal accidents during this period, involving 6 persons. Passenger miles flown per passenger fatality in the January-June, 1933, period were 38,321,196.

Personnel error led in the causes of the accidents, accounting for 52.04 per cent of the mishaps. Aircraft failures with 18.51 per cent were next and weather with 14.82 per cent was third. Aircraft engine failures accounted for 11.85 per cent of the accidents.

Although 179 persons were involved in the 27 accidents, 106 suffered no injury whatever, 34 received minor injuries and 10 were severely injured. Domestic lines had 25 accidents in 17,723,665 miles of flying, averaging 708,947 miles per accident. The foreign extensions had 2 accidents in 3,793,993 miles of flying or 1,996,997 miles per accident.

Pacific Starts Passenger Service

PASSENGER SERVICE between New Orleans and Chicago has been inaugurated by Pacific Seaboard Air Lines, Inc.

Planes leave New Orleans and Chicago at 8:25 a.m. daily, arriving at their destinations at 6:40 p.m., after stopping at Memphis, Jackson and Springfield on the route. The planes, which have been carrying mail since June 3, are equipped to carry three passengers, but Carleton Putnam, president, has announced that two high-speed transport planes will be assigned to the route soon.

Faster Flights Increase Business

PASSENGER BUSINESS on Braniff Airways, Inc., has increased at least 10 per cent since the company cut an hour from the flying time from Dallas to Chicago, according to Bill Gange, district traffic manager. Ships now arrive at 7:15 p.m., after leaving Chicago at noon. Leaving Dallas at 2 p.m., the northbound plane arrives in Chicago at 8:30 p.m. Braniff is flying Pratt & Whitney-powered Lockheeds, which also carry mail and express.

AIR TRANSPORT ON COAST EIGHT YEARS OLD

THE EIGHTH birthday of air mail-passenger plane service on the Pacific Coast was observed September 15 by the Post Office and United Air Lines officials. From a round trip daytime flight with single engined planes the service has been expanded until four times as many miles are flown daily as eight years ago. Instead of single engined planes, passengers and express are flown nearly twice as fast in all-metal, multi-motored Boeings with 1100 horsepower engines. Fares today are only one-half of what they were in 1926.

Excursion Rates Extended

SUMMER EXCURSION rates over the New York-New Orleans airway have met with such favorable response that Eastern Air Lines, Inc., has extended them to November 1. It was originally planned to suspend the special rates on September 1.

Traffic increased 80 per cent on this route after the 30-day round trip excursions became effective, making a trip over this route cost less than a flight of similar length over any other line in the country.

Performance Record Made

BY COMPLETING 99.8 per cent of all mileage scheduled on its New York-Chicago-Pacific Coast and western lines, United Air Lines can claim a new mark for efficiency for long distance, large scale airline operation.

All but 2,942 miles of a total of 1,359,880 miles scheduled were flown, including 620,000 miles on the overnight schedule on the New York-Chicago-Pacific Coast, and Seattle-San Diego routes. For more than a year United has been flying approximately a million and a quarter miles a month on its transcontinental and other air routes.

New England Schedules Changed

A NEW schedule for air mail, passenger, and express service in Northern New England over the lines of Boston-Maine-Central Vermont Airways became effective September 17 with the installation of the fall schedule.

According to J. V. Sheehan, General Passenger Agent, the change was necessary by the shortening of hours of daylight and results in the planes being scheduled a little earlier than before. At the same time, one round trip between Boston and Bangor, Me., and a round trip between Boston and Burlington, Vt., which have been operated during the heavy summer travel season, were suspended until next year.

Under the new schedule, the mail and passenger plane for Maine points leaves Boston at 10:30 a.m.; stops at Portland, Augusta and Waterville, arriving in Bangor at 12:55 p.m. The westbound trip leaves Bangor at 3:35 p.m. and arrives at Boston Airport at 6:05 p.m.

On the New Hampshire-Vermont-Canadian line, the mail and passenger plane leaves Boston at 10:25 a.m.; stops at Manchester, Concord, White River, Montpelier-Barre and Burlington, with arrival in Montreal at 1:50 p.m. The return trip leaves Montreal at 2:35 p.m. and arrives at East Boston at 6 p.m.

Airway To Be Improved

A NEW lighted and radio-equipped airway to be constructed by the Bureau of Air Commerce, Department of Commerce, between Nashville, Tenn., and Washington, D. C., not only will improve air service in that part of the country but will also make available an alternate route across southern United States, according to Rex Martin, of the Bureau of Air Commerce. Funds were allotted by the PWA.

There now is a Federal airway from Los Angeles, by way of Dallas, Tex., to Atlanta, Ga., and thence to Washington and New York City. There also is a lighted and radio-equipped route from Dallas to Nashville. Installation of lights and radio on the Nashville-Washington section will offer the possibility of flying over the southern states from Washington to the west coast by way of Nashville, or by way of Atlanta, with complete aids to air navigation on either route. The airway via Nashville will be known as the southern transcontinental route.

More Mail Schedules Added

ADDITIONAL AIR mail schedules on twelve routes have been authorized by the Post Office Department, to improve the mail, passenger and express services on the more important air routes throughout the country.

The additional annual scheduled mileage to be flown with mail will be 5,479,144, which will increase the present annual mileage flown from 27,806,937 to 33,286,081.

Five cities, now without air mail service, will be served by the new schedules. They are Providence, R. I., New Haven, Conn., Elmira, N. Y., Scranton, Pa., and Youngstown, Ohio. Springfield, Mass., will be included on the direct route between New York and Boston.

Additional schedules on other routes are now under consideration by the Department.

Hanford Adds New Equipment

TRI-MOTOR service between Minneapolis, St. Paul and Omaha, connecting with similar service there to the Pacific coast, was inaugurated, September 1, by Hanford Tri-State Airlines, replacing single-motored service. Placing of these planes on the Twin Cities-Omaha route by way of Sioux Falls, S. D., and Sioux City, Ia., affords multi-motored airplane service to California, as connections are made at Omaha with United Air Line planes.

In addition to the two services formerly operating on the Hanford route between the Twin Cities and Chicago, a non-stop schedule was put into effect September 1, leaving Minneapolis at 1 p.m., and arriving at Chicago at 3:25 p.m. This service enables passengers to reach New York City at 9:30 p.m., Eastern Time, 7½ hours after leaving Minneapolis.

New Air Line In Montana

IN ORDER to furnish connecting air service from the nearest scheduled airline operations to the huge Fort Peck dam project at Glasgow, Mont., L. P. Quinn has established an air passenger service available between either Glasgow and Glendive, Montana, or Glasgow and Miles City, Montana. Arrangements have been made so that the service of the Quinn Airlines will connect with Northwest Airlines through Glendive or Miles City, both eastbound and westbound.

Equipment operated by the airline consists of a Travel Air, six-place cabin ship, and a four-place Stinson, Jr.

United Shows Passenger Increase

AN INCREASE of 30 per cent in its passenger traffic and 130 per cent in express shipments during the first eight months of this year over the corresponding period of 1933, is reported by United Air Lines, which transported 98,772 revenue passengers as against 76,028 during the same period of 1933

On the New York-Chicago-Pacific Coast route, the line is carrying 50 per cent of all the air mail in the United States.

During a thirty-day period United on this route flew 190,000,000 pound-miles of mail, its average mail load per plane being the equivalent of 20,000 pieces of mail. With the mail carried on its Salt Lake-Seattle and Seattle-San Diego line, added to its transcontinental loads, United is carrying nearly 60 per cent of all the air mail in the United States.

CONTRACT TO CARRY MAIL IN HAWAII AWARDED

THE POST Office Department has awarded a contract for carrying air mail on the Hawaiian Islands to Inter-Island Airways, Ltd., of Honolulu. The rate of pay for this service, which is to link the four large islands of the group, Oahu, Maui, Hawaii and Kauai, a distance of approximately 333 miles, will be 19.5 cents per airplane mile.

Brower Named Air Express Manager

APPOINTMENT OF Major L. G. Brower as general manager of General Air Express, was announced by Roger M. Combs, Jr., chairman of the system and air express traffic manager of American Airlines.

Brower has been connected with General Air Express as New York sales manager, since December, 1932, shortly after organization of the system.

Texas Operator Flies 391 Passengers

A TOTAL of 391 passengers was carried by Long & Harmon, Inc., on their southern and western Texas lines during June and July, the first two months the concern operated as passenger and air mail contractors. According to C. E. Harmon, attendance at the Dallas Aviation School, also operated by the company, has shown a large increase.

Air mail poundage showed a large increase with the Dallas-Brownsville line accounting for 9,935 pounds and the Dallas-Amarillo line for 11,620 pounds.

Faster Schedules Inaugurated

AEROVIAS CENTRALES, a subsidiary of Pan American Airways System, operating between El Paso, Texas, and Mexico City, will inaugurate a new schedule the first of this month. Beginning on that date, the line puts into operation a fleet of Lockheed Electras.

The schedule calls for an elapsed time of 7 hours 15 minutes between the two points, greatly decreasing the present elapsed time of 11 hours. The new planes will carry a complete crew.

Air Express Shipments Increase

GENERAL AIR Express shipments over Eastern Air Lines, Inc., were heavier in July than in June, although the number of shipments was nearly the same, according to C. P. Ryman, air express traffic manager.

July's shipments numbered 1,905 and weighed 13,552 pounds, while June's record was 1,907 shipments weighing an aggregate of 10,608 pounds, an increase of 2,944 pounds. The increase is partly attributed to heavier international shipments flying via Eastern Air Lines from Chicago, New York and other points to Miami, where they were transshipped to South American points via Pan American Airways.

July this year showed an increase of 655 shipments over the same month last year, with a resultant gain of 6,192 pounds. The average weight of packages sent by air express last month was 7.1 pounds.

Lower express rates went into effect on August 15.

Vultees Make Fast Flights

AMERICAN AIRLINES' new Vultee Wright Cyclone-powered V-1A transport plane required only 99 minutes to complete its initial flight between St. Louis and Chicago. The flight was made by way of Springfield and Peoria, a route 40 miles longer than the non-stop St. Louis-Chicago run, which is scheduled to be flown in 89 minutes.

The new Vultee has broken four speed records between cities of the company's system in less than six weeks, according to M. P. Bickley, St. Louis traffic manager. The outstanding record is the flight of 2 hours 59 minutes from Chicago to New York, bettering the old record by 11 minutes.

The new planes provide two round-trips daily between St. Louis and Chicago, one round trip to Dallas and Fort Worth, with a third St. Louis-Chicago flight operated with a tri-motored Ford.

Douglas Delivered to Pan American

A NEW Douglas luxury airliner, first of a fleet of six to be placed in service in Central and South America on the Pan American Airways System and the Pan American Grace, Inc., a subsidiary line, landed at the El Paso, Tex., Municipal field, making the trip there from Clover Field, Santa Monica, Calif., in 3 hours 50 minutes.

The plane was enroute to Lima, Peru, via Brownsville, Texas and Mexico City, where it will be placed in service between Buenos Aires and Cristobal.

At Brownsville, an automatic pilot and full radio equipment was installed.

E. T. Allen, test pilot for the Douglas company was at the controls, with C. R. D. Disher and T. F. Jardine, of Pan American Grace Airways, as co-pilots.

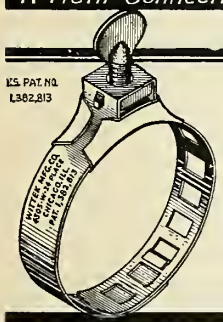
DEPENDABILITY & ACCURACY
proven at the
NATIONAL AIR RACES

THE National Air Races often act as the proving ground of aeronautical products—and a rigid one, too. While the Aeromarine instruments which functioned so perfectly in Roy Minor's Brown Special are not new to the industry, the various events in which Pilot Minor participated do prove beyond a shadow of doubt their accuracy and dependability, even under the rigors of fast and frequent pylon racing. ● The "Miss Los Angeles" proved itself, in the hands of Mr. Minor, one of the most outstanding racing planes this year. It was equipped with an Aeromarine Airspeed Indicator and an Aeromarine Tachometer—the latter in wide aircraft use as far back as 1918. ● The service which these instruments rendered under racing conditions is positive proof of their value to general commercial use.

Engineers, manufacturers, dealers and pilots are invited to write for our catalog which describes and illustrates the complete Aeromarine line—and for Aeromarine's liberal guarantee.

AEROMARINE INSTRUMENT CO., INC.
370 Gerard Avenue, Bronx, New York

"A Tight Connection All the Time"



TRADEMARK
NOC-OUT
THE
HOSE CLAMP
WITH THE THUMBSCREW

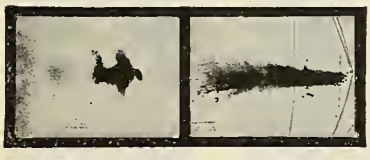
Standard equipment hose clamp of the automotive and airplane industry Your jobber has them

4307 W. 24TH PL. WITTEK
CHICAGO, ILL. MFG. CO.

Cutts Compensator

FOR HUNTING — MORE HITS, FEWER CRIPPLES
FOR SKEET, TRAPS — SCORES THAT WIN

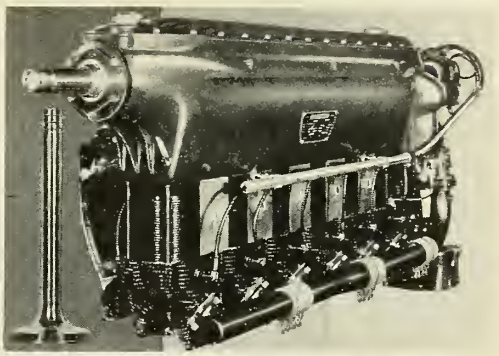
Every shot fired with Compensator - equipped shotgun gives remarkably uniform pattern. Recoil reduced, aiming greatly improved. For any bird, all shooting conditions. Made also for rifles. Interesting folder sent free. Write for it.



AT LEFT: Discharge without Compensator. Shot column pancaked through wad pressure. Distorted pellets, uncertain pattern.
AT RIGHT: With Compensator. Compact shot column, unaffected by wads or gas pressure. Uniform pattern.

The Lyman Gun Sight Corp., 67 West St., Middlefield, Conn.

30 OUT OF 40!



Menasco C6S "Buccaneer"—278 h.p. at 2500 r.p.m.

For the second year in succession MENASCO engines equipped with

JADSON VALVES

have won three times as many races as all other makes of engines combined! 30 out of 40 events won at the 1934 National Air Races! Such a record has never been equaled in motor performance and the JADSON MOTOR PRODUCTS CO., whose valves are standard equipment on MENASCO engines, takes pardonable pride in their participation in this outstanding achievement!

JADSON VALVES . . . . JADSON IN-LAY VALVE SEATS
JADSON PISTON PINS . . . . JADSON GUIDES

JADSON MOTOR PRODUCTS CO.
8354 Wilcox Avenue, Bell, California

DID you see Roy Minor's fast little "Brown Special", Miss Los Angeles, at the races? Of course Berryloid Aircraft Finishes were specified and used.

BERRY BROTHERS
VARNISHES - ENAMELS - LACQUERS - PAINTS
DETROIT, MICH. WALKERVILLE, ONT.

MASTER COURSE
FOR
MECHANICS

also Engineering Course. Thorough—Technical and Practical Training Under Specialists. Complete Equipment—Large Workshops—Live Engine Testing Under Actual Flight Conditions.

25 YEARS experience in training men for successful careers in the field of mechanics enables us to lay the proper foundation for you to achieve success in AVIATION. New classes now forming. Visit the school or write for facts. No obligation.

STEWART TECH SCHOOL
Dept. 834-K, 253-5-7 W. 64th Street, New York City
Founded 1909

United Officials Elected

FOLLOWING MEETINGS of the Boards of Directors of the various subsidiary companies of the newly formed United Aircraft Corporation held September 20, 1934 in the offices of the Pratt & Whitney Aircraft Co., E. Hartford, Conn., an announcement of the complete list of officials of the various manufacturing units, including all changes, was made by Donald L. Brown, president of the parent organization.

Mr. Brown will remain as president of the Pratt & Whitney Aircraft Company and Charles W. Deeds will continue as vice-president. Leonard H. Hobbs and Benjamin H. Gilpin have been promoted to vice-presidencies, while T. E. Tillinghast, former assistant to the president, has been made sales manager and will be assisted by H. M. Horner, who continues to serve also as secretary. Arthur W. Brooksbank, former auditor of the company, has been named treasurer and will be assisted by M. R. Dimery.

The organization of the engineering section of the aircraft engine factory will remain unchanged with Andrew V. D. Willgoos, Chief Engineer in charge of all engineering and experimental development operations.

E. E. Wilson, recently elected vice-president of the United Aircraft Corporation, will continue as president of the Chance Vought Corp., one of the plane manufacturing subsidiaries of the parent company; Charles J. McCarthy will continue as vice-president, and J. J. Gaffney has been elected secretary and treasurer. Thomas A. Conlan and Joseph A. Barr will assist Mr. Gaffney as assistant secretary and assistant treasurer respectively.

Raycroft Walsh will continue in his capacity as president of the Hamilton Standard Propeller Company. Sidney A. Stewart has been elected vice-president and continues in his former capacity as secretary while Arthur W. Brooksbank will be treasurer.

The organization of the Sikorsky Aviation Corporation in Bridgeport remains practically unchanged with Frederick W. Neilson, president; Igor I. Sikorsky vice-president; E. H. Glaettli, secretary-treasurer; and L. C. Mallett assistant secretary-treasurer.

Bernard L. Whelan, former manager of United Airports of Connecticut and Rentschler Field, has been made president of that organization; Martin F. Burke has been elected treasurer, H. M. Horner, secretary, M. T. Reid, assistant secretary, and J. P. Seaman, assistant treasurer.

E. K. Hubbard, 2nd, former secretary and treasurer of the Chance Vought Corp., who resigned from that capacity to take over special duties with the parent company, will be located at the Pratt & Whitney Aircraft Company.

VERVILLE APPOINTED TO BUREAU POST

ALFRED V. VERVILLE, airplane designer and former manufacturer, has been appointed chief of the Manufacturing Inspection Service of the Bureau of Air Commerce, succeeding John H. Geisse, who recently became Chief of the Development Section. Verville will supervise the examination of engineering plans for new-type airplanes, and inspection of completed planes which are submitted to the Department for approval.

Manning Heads Cord Corporation

L. B. MANNING has been elected president of the Cord Corporation, and E. L. Cord will remain a director and a member of the executive committee. R. S. Pruitt, general counsel for the corporation, was elected a vice-president.

W. H. Beal, recently elected a vice-president of the corporation will establish offices in Chicago and become Manning's assistant, in charge of manufacturing for all Cord companies.

Bureau Inspectors Transferred

LAWRENCE C. ELLIOTT has been named manager of the Fourth Air Navigation District with headquarters at Fort Worth, succeeding George C. Miller, who has been transferred to the Salt Lake City District by the Department of Commerce. Elliott is a graduate of Kelly Field where he became an instructor.

14 Bid On Department Plane

BIDS FOR 25 airplanes for the Bureau of Air Commerce were opened in Washington recently when 14 manufacturers made efforts to meet requirements for these planes.

Non-stallable and non-spinning characteristics were expected of these ships inasmuch as the Bureau required certain stability features. The specifications called for low landing characteristics and great visibility.

No definite date has been set for awarding the contract, but it probably will be some time because detailed examination of the designs will be made.

Those bidding and the amount asked for each plane were Cunningham-Hall Aircraft Corp., Buffalo, N. Y., $6,425; Waldo D. Waterman, Santa Monica, Calif., $2,493.87; St. Louis Aircraft Corp., St. Louis, Mo., $3,395; Hartford Aircraft Corp., Hartford, Conn., $2,650; Church Airplane & Mfg. Co., Chicago, Ill., $1,695; Spartan Aircraft Co., Tulsa, Okla., $3,750; Hammond Aircraft Co., Ypsilanti, Mich., $3,190; Curtiss-Wright Airplane Co., Robertson, Mo., $2,995; Kreider-Reisner Aircraft Co., Inc., Hagerstown, Md., $6,200; Amphibions, Inc., Garden City, N. Y., $6,670; Safety Air Transportation Co., Indianapolis, Ind., $750; Arrow Aircraft & Motors Corp., Lincoln, Neb., $3,495, with K-5 Kinner, $3,995 with B-5 Kinner; Campbell Aircraft Co., St. Joseph, Mo., $1,650, and Niagara Amphibions Aircraft Corp., Buffalo, N. Y., $3,250, with wood hull, $4,000 with metal hull.

Fleetwings Buys Keystone Plant

THE OLD Keystone Aircraft plant at Bristol, Pa., consisting of 31 acres of land and one-half mile of waterfront on the Delaware River, 10 miles from Trenton, has been purchased by Fleetwings, Inc., of Roosevelt Field, Mineola, N. Y.

Fleetwings will move on the property which consists of some 35 buildings including hangar, office and main factory. There it is planned to maintain hangar and service facilities for amphibions and seaplanes as well as conducting its manufacturing activities.

The company specializes in the "shot-weld" system of stainless steel.

Raycroft Walsh

Bernard L. Whelan

Donald L. Brown

E. E. Wilson

F. W. Neilson

Airline Installs Controllable Props

EASTERN AIR Lines is now equipping its aircraft with controllable-pitch propellers which will add approximately 10 miles an hour to their speed and permit greater operating efficiency, it was stated by Charles W. France, operations vice-president.

Eastern Air uses the Hamilton Standard Hydro Controllable-Pitch Propeller. The mechanism consists principally of a piston, a cylinder, two centrifugal lugs and a cam. By moving a lever, the pilot applies oil pressure from the engine to the piston, forcing it outward and setting the propeller pitch at 23 degrees. With this setting the pilot takes off, obtaining full engine power and propeller efficiency. Once in the air he turns the lever again, the hydraulic pressure is relieved and the centrifugal lugs automatically reset the propeller pitch to 28 degrees, giving maximum flight efficiency.

Italy Rewards Stanavo

RECOGNITION BY the Italian government was extended the Standard Oil Company (Indiana), in the form of a silver medal presented to John Porter, head of the company's aviation department, for efficiency and cooperation in refueling Italy's fleet of twenty-four seaplanes during its visit to A Century of Progress last summer, following a flight from Rome to Chicago under the command of General Balbo.

Monro Elected President

C. BEDELL MONRO has been appointed by the Board of Directors of Pennsylvania Airlines and Transport Company as president, succeeding Col. H. S. Martin, who resigned.

Mr. Monro was one of the organizers and secretary of Pittsburgh Aviation Industries Corp. Later he became vice-president and when the firm purchased Pennsylvania Airlines became executive vice-president.

When the mail contracts were rebid, Pennsylvania Airlines won the route between Detroit and Milwaukee, and later purchased Kohler Aviation Corp., extending its service from Detroit to Milwaukee across Lake Michigan.

. Digest of Recent Events .

Airliner Flies From Chicago In Record Time

AVERAGING MORE than four miles a minute for the 724 miles between Chicago and New York, a Wright Cyclone-powered Vultee V-1A airliner owned by American Airways set a speed record for the run when it arrived at Newark Airport 2 hours 59 minutes 2 seconds after taking off from Chicago. Earl Ward, operations manager of the airline, was at the controls and was accompanied by Ira Sloniger, chief pilot of the airline's eastern division. The former record between the two cities was made by Jimmy Haizlip, in a racer, in 3 hours 10 minutes. AUG. 25.

S-41 Clips Two Days From Old Schedule

CLIMAXING A 15,000-mile flight through South American countries with a 1840-mile flight in one day from Port of Spain to Miami, the *Brazilian Clipper* S-41 arrived at the Pan American Airways flying base in Miami with a record-breaking hop. The S-41 brought Buenos Aires, 7400 miles away, within five days and Rio de Janeiro, 6000 miles away, within four days of Miami, cutting two days from the Buenos Aires time. AUG. 30.

Turner Breaks Speed Record East Over U. S.

ROSCOE TURNER bettered by 2 minutes 39 seconds the west-east cross-continent speed record he established last September when he landed at Floyd Bennett Field, Brooklyn, N. Y., 10 hours 2 minutes 51 seconds after taking off from Burbank, Calif. The flight was 2512 miles in length and was made after Turner had been forced out of the Bendix Transcontinental Race by being unable to start with the competitors. Vincent Bendix offered $3,500 for the pilot who set a new record from coast-to-coast. Turner flew his special P. & W. Hornet-powered Wedell-Williams racer at an average speed of about 250 miles an hour to establish the new mark. SEPT. 1.

Jersey Glider Crown Won By Streeter

JACK STREETER, of Newark, N. J., captured the State glider flying championship at a three-day meet at Glider Port, Lyons, N. J. The club championship went to the Y Flying Club. Streeter gathered a total of 1,121 points compared to his closest competitor, Leslie Barton, who had 752 points. The events included spot landing contests, endurance flights and precision flying. SEPT. 3.

Wiley Post Ascends 40,000 Feet In Test

WILEY POST climbed his plane, the *Winnie Mae,* more than 40,000 feet into the stratosphere as a prelude to his effort to establish a new altitude record for heavier-than-air craft. Post spent 2 hours 2 minutes in the air making tests of the plane and of the special rubber suit he prepared for his work in the rarified atmosphere. SEPT. 5.

Vultee Sets New Inter-City Records

NEW CITY-TO-CITY records were established by the new Vultee V-1A transport when, operating over American Airline's routes, the low-wing, all-metal Wright Cyclone-powered plane flew between St. Louis and Chicago in 99 minutes. The Vultee only recently established a new Chicago-New York record by flying betwen the two cities in 2 hours 59 minutes, 11 minutes ahead of the old mark. SEPT. 9.

Turner and Pangborn Make Fast Flight

FLYING A new Boeing 247-D, Roscoe Turner and Clyde Pangborn flew from Seattle to Los Angeles, a distance of 1120 miles in 5 hours 20 minutes, said to be a new record for the distance. The pair then left Los Angeles and proceeded to New York via Pittsburgh, arriving in Pittsburgh, where they were grounded by the weather, in 12 hours 10 minutes, including a stop-over at Wichita. The average speed for the first hop was 204.6 m.p.h., while the average speed for the transcontinental flight was 189 m.p.h. SEPT. 11.

British Mail Flown In Record Time to Pacific

COOPERATION OF British shipping with the air mail services of Canada and the United States is taking mail from England to Montreal, New York, Chicago, San Francisco and Seattle and reaches Pacific Coast points, a third of the way around the world in 5 days 18 hours. Leaving Southampton, the Canadian Pacific liner *Empress of Britain* reached Rimouski four and a half days later. There the mail was transferred to a Canadian Airways plane which flew to Montreal, where it was picked up by an American Airlines' plane and flown to Newark, N. J. From Newark, the mail was loaded aboard a United Air Lines Boeing and flown to the Pacific coast. No official announcement has yet been made as to the extent to which the service will be continued. SEPT. 13.

Ellsworth Ready To Start for Antarctic

DR. LINCOLN ELLSWORTH arrived in Dunedin, N. Z., preparatory to his departure for the South Polar regions where he will undertake his second expedition. Last year, Dr. Ellsworth completed successful tests in his Northrop *Delta,* but subsequently the plane was damaged in an ice crush and the expedition had to return. The plane, called the *Polor Star,* has been repaired and Dr. Ellsworth plans to fly in it from Deception Island to the Ross Sea via the Weddell Sea. SEPT. 14.

. Coming Events .

Aerial Tour

1934 Air Tour of Kansas. Sponsored by Wichita Aviation Club and Wichita Exchange Club. OCT. 3-6

Airport Dedication

Formal dedication of municipal airport, Raleigh, N. C. OCT. 4

Air Derby

Johnstown air derby and air races. Johnstown Airport, Johnstown, Pa. OCT. 6

Air Show

Third annual air show and races. Jack Tweed, Manager, Municipal Airport, New Haven, Conn. OCT. 7

N.A.A. Convention

1934 Convention of National Aeronautic Association, Washington, D. C. OCT. 11-13

Women's Meet

All Women's Air Meet, Washington Women Pilots Association, College Park Airport, Washington, D. C. OCT. 13-14.

MacRoberston Race

London-Melbourne International Air Race. Speed and handicap event. Under regulations of F.A.I. and competition rules of Royal Aero Club. Sponsored by Sir MacPherson Robertson. OCT. 20.

Air Show

Fourteenth International Aero Salon, Paris, France. NOV. 16-DEC. 2.

Challenger Race

Handicap race for Viceroy's Challenge Trophy. From Calcutta to Bombay. DEC. 15-16.

Menasco Incorporates

INCORPORATED TO take over Menasco Manufacturing Company, aircraft engine organization which has been operating as a proprietorship, Menasco Manufacturing Company, a corporation, has been granted a permit by the State of California to issue 98,203 shares of an authorized 500,000 shares of $1 par value.

A. S. Menasco, president of the new corporation, has been identified for the past six years with the development of the in-line, inverted, air-cooled engine which bears his name. Five approved type certificates have been issued covering a series of Menasco engines ranging from 95 to 160 h.p., while two engines of greater horsepower are now being given endurance runs preliminary to A.T.C.

Officers of the new corporation are: A. S. Menasco, president; Charles F. McReynolds, vice-president; Reed H. Parkin, secretary and treasurer.

Arup Moves Factory

MANUFACTURE OF the Arup airplane developed by Dr. C. L. Snyder, has been transferred from South Bend to Indianapolis, following the election of three new members to the board of directors of the Arup Manufacturing Company.

C. H. Ruggles, Robert L. Brown and Ralph R. Graichen, who has been chief engineer, have been added to the directorate, the latter also being elected vice-president in charge of production. Glen Doolittle, test pilot with the company since the development of its first plane, has gone to Indianapolis as chief pilot and draughtsman.

The first commercial model yet to be produced, has been sold to W. W. Williams of Miami, Fla.

Dutch Air Line Buys Douglas

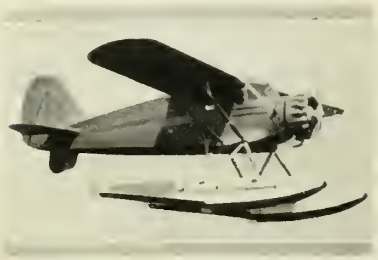
A MOST significant delivery of American aircraft to a foreign operator was completed at Glenn Curtiss Airport, North Beach, N. Y., when the first 14-passenger Douglas Airliner to leave this country was turned over to the Fokker Company, foreign agents for the Douglas Company, for delivery to the Royal Dutch Air Lines (K.L.M.).

The ship was flown from Santa Monica, California, by Carl Cover, vice-president of the Douglas Aircraft Co., assisted by K. D. Parmentier one of the chief pilots of K.L.M. Among the passengers were H. Veenendaal, chief maintenance engineer of K.L.M., and representatives of the Wright Aeronautical Co., the Shell Oil Co., and the Fokker Company who were making technical observations of the ship's operation.

Parmentier is to fly this particular airplane for the Royal Dutch Air Lines in the forthcoming London-Australia Race. K.L.M.'s participation in the race will precede a proposed five-day service between Amsterdam and Batavia. It is understood that they are considering the purchase of a number of Douglas Airliners and also a number of Lockheed Electras for use on this and their European routes. (See photograph, page 12.)

Forestry Service Gets Stinson

A NEW Stinson Reliant cabin monoplane equipped with Edo model 38-3430 floats was delivered to the Maine Forestry Department by E. W. Wiggins Airways, Inc., of Providence, R. I., Stinson distributors. The plane, the department's second, will be used throughout the State



Edo-equipped Stinson for Forestry Service

to aid in locating and fighting forest fires and will be flown by Lt. Earl F. Crabbe. Its base will be at Cobbosseecontee Lake near Augusta.

Hamilton Props To Be Made Abroad

LICENSE AGREEMENTS for the manufacturing rights of Hamilton Standard controllable-pitch propellers have been completed with the deHavilland Aircraft Company, Ltd., for the British Empire (except Canada); with Societe Francaise Hispano-Suiza for France and her colonies, and with Mitsui & Company, Ltd., for Japan and Manchukuo.

Raycroft Walsh, president of Hamilton Standard Propeller Co., and Frank W. Caldwell, chief engineer, went abroad to complete the negotiations.

Tool Company Moves Offices

CHICAGO PNEUMATIC Tool Company has moved its Birmingham, Ala., office from 1829-31 South Second Avenue to 211 South 20th Street. This change provides increased facilities for both sales and service activities. Mr. W. S. Lynch is Manager of the Birmingham District Office.

Wright Produces 1000th Cyclone

A LITTLE more than two years after the first Series F Cyclone engines came off the line at the Wright Aeronautical Corp., Paterson, N. J., engine No. 1000 completed its production tests and was delivered to the Douglas Aircraft Corp., which will install it in a Douglas transport for Pan American Airways.

Approved Type Certificates Awarded

SIX AIRCRAFT, two engines and three propellers successfully passed Department of Commerce tests and were awarded approved type certificates as follows:

Douglas Aircraft Co., Santa Monica, Calif., model DC2, 16-place closed land monoplane powered by two Wright Cyclone SGR 1820F3 engines of 710 h.p., each. A.T.C. 540.

Ryan Aeronautical Co., San Diego, Calif., model ST, 2-place open land monoplane powered by a Menasco B-4 engine of 95 h.p. A.T.C. 541.

Waco Aircraft Co., Troy, Ohio, model YMF, 3-place open land biplane powered by a Jacobs L4 engine of 225 h.p. A.T.C. 542.

Waco, model S3HD, 2-place open or cabin land biplane powered by a Pratt & Whitney TB, 420 h.p. engine. A.T.C. 543.

Waco, model UMF, 3-place open land biplane powered by a Continental R-670 engine of 210 h.p. A.T.C. 546.

Curtiss-Wright Airplane Co., Robertson, Mo., model Condor T32C 17- or 18-place closed land biplane powered by two Wright Cyclones SGR 1820F2 of 720 h.p., each or SGR 1820F3 at 710 h.p. each. A.T.C. 547.

Wright Aeronautical Corp., Paterson, N. J., model Whirlwind R760ET, a seven-cylinder, radial, air-cooled engine rated 235 h.p., at 2000 r.p.m. 73 Octane. A.T.C. 126.

Pratt & Whitney Aircraft Co., E. Hartford, Conn., model Hornet S5DI-G, a nine-cylinder, radial, air-cooled engine rated 700 h.p. at 2150 r.p.m. at 3500 ft. 87 Octane. A.T.C. 127.

Lycoming Manufacturing Co., Williamsport, Pa., model Smith P431 hub, controllable-pitch, 3 blades; rated 735 h.p. at 1950 r.p.m. A.T.C. 474.

Lycoming, Model Smith P220 hub, controllable pitch, 2 blades, 5.25 inch engine bore limit; rated 260 h.p. at 2300 r.p.m. A.T.C. 475.

Eclipse Aviation Corp., E. Orange, N. J., model F33307 blade, 8 ft. 8 in., to 7 ft. diameter, aluminum alloy, automatic; number of blades optional: 125 h.p. per blade at 2100 r.p.m. A.T.C. 476.

U. S. Navy Awards Gasoline Contract

THE UNITED States Navy has awarded its entire aviation gasoline contract for the Atlantic seaboard to the distributors of the Stanavo Specification Board, Inc., according to an announcement made by the Standard Oil Company of New Jersey, which, together with the Colonial Beacon Oil Company and the Standard Oil Company of Pennsylvania will supply the planes of the fleet with 1,998,800 gallons of aviation gasoline from August 1 to October 31.

(Continued on following page)

★BOOM THAT BUSINESS . . . EQUIP WITH EDO'S

★ FOOT OF WALL ST., NEW YORK
New Seaplane ramp on East River
3 minutes from N.Y. Stock Exchange

Cities are awakening to the day of the seaplane. Landing fields may be distant, but a waterway and a simple ramp bring air commerce on EDO Floats right up to the business doorstep. Wise operators are locating their own bases or find them already provided. Equip with EDO's and watch profits mount skyward with charter, commuting, sight-seeing and instruction flights. Write for complete details. EDO AIRCRAFT CORPORATION, 610 Second Street, College Point, Long Island, N. Y.

EDO FLOATS

FLEETWINGS ANNOUNCES

'SHOTWELD" STAINLESS STEEL

GASOLINE TANKS

Fleetwings has at last perfected, after months of research, Stainless Steel Gasoline Tanks that represent a forward step for the industry. These tanks have passed every vibration and drop test with perfect results. Due to the Shotwelded Stainless Steel, these tanks are corrosion-proof and unusually light and strong. Properly designed, their resistance to fatigue is remarkable. Light weight is a particular feature and in some shapes, these tanks are as light as .35 pounds per gallon. Engineers and manufacturers are invited to write for full information (please use your letterhead). We will be glad to hear from you, or consult with you on gasoline and oil tank problems.

CONTRACTORS TO THE ARMY AND NAVY

FLEETWINGS INCORPORATED — BRISTOL PENNA.

AMERICAN STEEL SHEETS

FOR ALL KNOWN USES

KEYSTONE COPPER STEEL — AMERICAN SHEET AND TIN PLATE COMPANY — PITTSBURGH

In Aviation Fields

Use sheet metal products of recognized reputation and value for hangars, shops, sheds, culverts, and similar purposes.

Insist upon AMERICAN Black Sheets, Keystone Rust Resisting Copper Steel Sheets, Apollo Best Bloom Galvanized Sheets, Galvannealed Sheets, Heavy-Coated Galvanized Sheets, Formed Roofing and Siding Products, Tin Plates, Terne Plates, Black Plate, Etc.

Write us relative to your sheet steel requirements. This Company also manufactures U S S STAINLESS and Heat Resisting Steel Sheets and Light Plates for all purposes.

AMERICAN SHEET AND TIN PLATE COMPANY, Pittsburgh, Pa.

SUBSIDIARY of UNITED STATES STEEL CORPORATION

for Success in AVIATION You Need LINCOLN Training

LINCOLN is ready to train you for a big pay job and a fascinating career as pilot or master mechanic . . . to give you the proper training with unexcelled equipment and Government Licensed instructors.

Government Approved School. Primary and advanced flying. Training includes night flying, blind flying, acrobatics, cross country flying, etc. Master Airplane and Engine Mechanics course prepares you for mechanic's position.

$500 a Month—That's the kind of pay airline pilots earn. Airplane and Engine Mechanics also earn good pay. Let Lincoln's unexcelled training equip you for these better aviation jobs. Government spending millions promoting aviation means thousands of new jobs. Backed by 14 years experience teaching aviation. 24 years successful mechanics trade school. Write. Please state your age.

LINCOLN AIRPLANE AND FLYING SCHOOL
305D AIRCRAFT BLDG. LINCOLN, NEBRASKA

MAKE MONEY

building this 32" absolutely accurate 100% flying scale model.

Stinson Reliant kit cost $2.50
Finished planes sell from $15 up

This beautiful flying Stinson Reliant, an absolutely accurate scale reproduction in exact ¾" scale, is in great demand. An easy, fascinating and profitable hobby. You can build it in your own home, in your spare time, from the most complete kit you ever saw. Easily followed blueprint and instruction chart. Guaranteed to fly; makes a beautiful and decorative ornamental piece and provides an exceptional money making opportunity.

Free Illustrated Folder

. . . shows how to make money. Write us today for new illustrated folder showing the latest model planes, and explaining in detail the unusual money making opportunity now open in building and selling IDEAL Model planes. Big demand for finished IDEAL planes for home decoration, for flying, and for business display purposes. Write today.

IDEAL AEROPLANE & SUPPLY CO., INC.
24-26 West 19th Street New York, N. Y.

(*Continued from preceding page*)

N.A.A. Convention October 11-13

THE 1934 Convention of the National Aeronautic Association will be held in Washington, D. C., October 11-13, immediately following the meetings of the Federation Aeronautique Internationale.

The convention will open with a banquet in honor of the delegates attending the international conference and delegates from the forty-eight states, Hawaiian Islands, Puerto Rico and the District of Columbia, are expected to attend.

Invitations to address the business sessions have been extended to Clark Howell, Sr., Chairman of the Federal Aviation Commission; Major General Benjamin D. Foulois, Chief of the Army Air Corps; Rear Admiral Ernest J. King, Chief of the Bureau of Aeronautics; and Eugene L. Vidal.

Fighter Demonstrator For China

SHIPMENT OF a Model 281 single-seater, all-metal Wasp-powered fighter to China as a demonstrator, is reported by the Boeing Airplane Co., Seattle. The plane is similar to the P-26A planes built by the company for the Army Air Corps; but is equipped with trailing edge flaps which reduce landing speed by approximately 8.5 m.p.h.

Stinson Tri-Motor Introduced

A FAST new tri-motored airliner, which has been under development for the last two years, was announced by B. D. DeWeese, president of the Stinson Aircraft Corp., Wayne, Mich.

The airliner is a low-wing monoplane with outboard engines mounted in the wings and double braced to the fuselage. It carries eight passengers, two pilots and 500 pounds of baggage, mail and express, in addition to radio and other airline equipment, and has a top speed in excess of 180 m.p.h., and cruises at more than 160 m.p.h.

Streamlining and aerodynamic principles have aided materially in making possible the new Stinson's speed. Principal among these are a new type double tapered sesqui-spar wing, the use of retractable landing gear, a rounder and broader fuselage and the utilization of flaps which permit reduced wing area.

Four Douglases Sold to General

PURCHASE OF four Douglas luxury liners for equipment on its San Diego-Los Angeles-Las Vegas-Salt Lake City airline following structural and speed tests, was announced by the Board of Directors of General Air Lines.

Delivery of the planes by October 1, and inauguration of service over the 700-mile route October 15, is expected and the present flying time of 6 hours 45 minutes will be reduced to 3 hours 55 minutes, the operations department estimated.

The four planes and spare engines which cost $326,820, will replace Fokker multi-motor equipment.

Additional refinements will be incorporated in the planes following improvements completed at the Santa Monica, Cal., factory since production began last spring. The six-foot cabins will have wide aisles and 14 tubular seats. A large lavatory and clothes closet will be built aft in the cabin.

Huntley in Dayton Territory

O. J. HUNTLEY, precision boring demonstrator for Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich., has been transferred to their sales staff and will be located in the Dayton territory. Huntley will be handling the complete line of Ex-Cell-O products consisting of all types of cutting tools, bushings, spindles, multiple equipment and precision boring equipment.

Boeing Large Aluminum Buyer

MORE THAN 228 tons of aluminum and aluminum alloy products were purchased by the Boeing Airplane Company in 1933, for use in its all-metal commercial and military planes. Not including rivets, there were 456,632 pounds delivered to the plant, of which 370,000 pounds were in sheet form.

Bureau Tests Radio Reporter

RADIO TRANSMISSION of the facsimile of a typed or hand-written message may be a future method of disseminating weather information on the Federal Airways System, if experiments now under way by the Department of Commerce prove successful. A system of radio facsimile transmission has been given a preliminary test by the Bureau of Air Commerce.

The Bureau also has under consideration other methods of transmitting radio messages so that they can be received in recorded form, but will not make any change in the present communications system of teletype machines until all of these investigations have been completed.

Facsimile transmission, as tested by the Bureau, is based on the scanning beam principle. In the tests, messages were transmitted from the Washington, D. C., airways radio station at Silver Hill, Maryland to the Department of Commerce building in Washington, D. C.

Rex Martin, Assistant Director of Air Commerce in charge of air navigation, who arranged for these experiments, said that both the transmitting and receiving machines were compact, and could be set up for operation by plugging them in, respectively, in a transmitting set in place of the microphone and in the receiving set as a substitute for the headphones or loud speaker.

New Weather Stations Opened

DEPARTMENT OF COMMERCE weather reports for pilots are now available at Fort Worth, Amarillo and Big Spring, Texas, and can be received on radio sets receptive to the Federal airways frequencies from 200 to 400 kilocycles. Flyers can get reports on radiophones, a new service in addition to the regular hourly reports now transmitted throughout the nation by the Department's communications system.

Map Series To Be Completed

SECTIONAL AIRWAY maps, showing geographical characteristics, political boundaries and other features such as beacon lights, airports and radio stations, will be available for every part of the United States in about eighteen months, according to Rex Martin of the Bureau of Air Commerce.

Eighty-seven units will be included in the sectional series, representing the first comprehensive, detailed map of the United States ever published. The nation has been mapped in its entirety before, but never by the thorough process that is in effect for the Department of Commerce air navigation maps.

The sectional airway maps will be useful for purposes other than air navigation. In some sections they will be the only detailed maps available.

More Electras Delivered

EFFECTIVE SEPTEMBER 3, Northwest Airlines, Inc., further improved its transcontinental service from Chicago to Seattle by taking delivery of new bi-motor Lockheed Electra equipment which has made it possible to reduce the westbound schedule from Chicago to Seattle by approximately 90 minutes, and eastbound by one hour.

The new schedule provides for departure from Chicago at 5:15 a.m. with arrival in Seattle at 6:25 p.m.

Plans For Airship Terminal Progress

RESPESS AERONAUTICAL Engineering Corp., Cranston, R. I., has applied for a loan from the RFC to finance the construction and operation of two airships, an airship factory, and a dock, for trans-Atlantic airship service. A bill has been introduced in the House of Representatives by Representative Francis B. Condon authorizing a loan of $12,000,000 to the Respess Company. The airships are to be 7,000,000 cubic feet capacity of a new suspension-bridge type design.

Ellsworth's Northrop Delta mounted on Edo floats

July Exports Reach Peak

REACHING THE highest point in the past eleven months, exports of aeronautical products from the United States during July, 1934, totaled $1,730,762. This figure is almost $500,000 more than was done in the last best previous month, April, 1934.

The greatest part of the export business was in aircraft, with 42 planes, valued at $1,020,442, going to purchasers in foreign countries. Exports of parts and accessories were the next highest with $471,162 realized while 34 engines brought $119,775. The balance was made up from the sale of parachutes and parachute parts.

China purchased $573,405 worth of American products including 16 aircraft and 2 engines. Poland spent $24,700 for American aircraft engines while the Union of Soviet Russia took $230,453 worth of parts and accessories. Peru spent a total of $318,226 for aircraft, engines and accessories.

Aircraft were also purchased by the following countries: Peru (9), Bolivia (5), Brazil (4), Hawaii (2) and one each by Norway, Canada, Panama, Mexico, Hong Kong, Philippine Islands, Egypt and the Union of South Africa.

Ryan Reduces Prices on S-T

REDUCTIONS OF $300 in certain models of the new Ryan S-T series have been put into effect by the Ryan Aeronautical Corp., San Diego, Calif., according to Earl D. Prudden, sales manager.

The super-sportster is now offering as optional equipment a special sliding "all-weather" cockpit hood. The cover, which slides forward when not in use, has been so designed that it is easily operated when in flight. It can be built for either or both of the tandem cockpits.

WACO AIRCRAFT SHOWS PROFIT OF $25,433

WACO AIRPLANE Co., Troy, Ohio, for the six months ended June 30, 1934, had a net profit of $25,433.05 after deducting administrative, selling and engineering expense. Net sales for the period were $544,705.86 and net manufacturing profit $129,394.32.

17 Fairchilds Delivered

WITH SEPTEMBER production already sold and the majority of the planes to be produced in October definitely assigned, Fairchild sales are continuing despite the anticipated seasonal fluctuation. In addition, work on the six high-speed, 10-place amphibions for Pan American Airways, is rapidly nearing completion.

A partial list of September deliveries reveals 17 Fairchilds in the hands of new purchasers. Three were 22's, and 14 were the 3-place cabin job, one of which was exported to Eugene Minneit of Italy.

Wright Distributor Appointed

GRAND CENTRAL Air Terminal, Glendale, Calif., has been made distributor for Wright engines and parts for the southwest, according to Major C. C. Moseley, president and general manager of the field.

Repair Approval Regulations Eased

ELIMINATING INVOLVED procedure and consequent inconvenience and expense to manufacturers and repair agencies, new and more direct methods of approving alterations and repairs to licensed aircraft have been placed in effect by the Aeronautics Branch of the Department of Commerce, to remove where possible, with safety, any regulations or policies which may stand in the way of reduced costs, or which may otherwise hamper the industry.

The new methods, worked out by Col. J. Carroll Cone, Assistant Director of Aeronautics and his staff, provide for approval by an inspector of minor alterations and repairs made in accordance with accepted practice and which, in the opinion of the aeronautical inspector are safe and satisfactoy. This eliminates the necessity of submitting detailed drawings and technical data to the Aeronautics branch in Washington.

A repair agency now need only send to the Branch, for record purposes, information showing that proper repair specifications were followed.

In order to facilitate this policy and avoid any misunderstanding by either inspectors or repair agencies, a bulletin, now being prepared, will include drawings showing in detail the most common types of repairs. Types not specifically covered may be referred to the Branch for final decision if the inspector thinks it necessary to do so.

Deviations from approved type certificate drawings and specifications which do not affect the primary structure may also be approved at the factory by an inspector. Drawings with these changes then will be forwarded to the Branch.

Six Beechcraft Delivered

DURING THE past few weeks, six Beechcraft were delivered to their purchasers by the Beech Aircraft Co.

All were Jacobs 225-powered jobs and went to the Hartol Products Co., New York, N. Y.; Newark Air Service, Inc., Newark, N. J.; Beechcraft Sales, Inc., Philadelphia, Pa.; Ward & Pearson, Inc., Roosevelt Field, Mineola, N. Y.; Standard Oil Company of New Jersey and H. L. Farquhar, Mexico City, Mex.

FOREIGN NEWS IN BRIEF

Australasia

BEATING THE best previous mark for a similar flight by 41 hours, C. J. Melrose flew 8,000 miles around the coast of Australia in 5 days 11 hours. Melrose piloted a Gypsy-powered Puss Moth, starting from Adelaide. The plane is also entered in the MacRobertson races.

THE ANNUAL race for the Viceroy's Challenge Trophy, to be held December 15 and 16, is a handicap race open to aircraft with engines under 400 horsepower registered in India or other parts of the British Empire. The course will be from Calcutta to Cawnpore on the first day and from Cawnpore to Bombay on the second, with checking points along the route. Prizes will include the Viceroy's Challenge Cup, other trophies and cash.

MISR AIRWORK, operating a number of routes in Egypt, including lines between Egypt and Palestine, Port Said, Mersa Matruh and between Cairo and Ras el Bar, carried more than 500 passengers during the first three weeks of August. The company also operates three flying schools, one in Cairo, another in Alexandria and a third in Port Said.

A REPORT of passengers carried by Qantas, Ltd., for the fiscal year ending June 30, 1934 shows that traffic over the airline was 24 per cent greater than the previous year and very nearly reached the peak period of 1930. In all, 3,073 passengers were carried as well as 19 tons of freight and express matter. Traffic in some cases was so heavy that passengers were turned away.

AN AERIAL survey costing £150,000 will be undertaken in northern Australia with Mount Isa in Queensland, Port Hedland in Western Australia and Daly Waters as the bases from which the planes will operate. These centers are on established airline routes and have complete aerial facilities.

TO PROVIDE for aircraft launching of the 24 Seagull Five amphibions ordered in England, the Commonwealth Government of Australia has purchased several catapults which will be placed on its cruisers and carrier ship.

Canada

CAPREOL & AUSTIN, Ltd., Waco dealers in Toronto sold three de luxe cabin jobs in one week. These planes, for the mining fields of northern Ontario, will be fitted with pontoons.

TRAFFIC HAS been heavy this past month at the air harbor on the downtown Toronto waterfront. A number of planes from the United States have visited the base, and the firm of Capreol and Austin have been busy taking vacationists north to various resorts, and with delivery of new planes to mining camps.

THE MARITIMES Goodwill Flight during August touched at most points in the three Maritime provinces of Nova Scotia, New Brunswick and Prince Edward Island. The tour was in charge of George Ross, executive of the Canadian Flying Clubs Association, who carried as passenger Lieut.-Col. George A. Drew.

Installing one of the four Junkers Juno-4 engines in a G-38 transport plane

Great Britain

TWELVE IMPORTANT cities and towns in Great Britain and Ireland are now linked by the new inland air mail service flown by Railway Air Services, the combined Imperial Airways and four railway groups organization. Four-engined de Havilland D.H. 86's are flying over the route.

PLANS FOR the establishment of an airport in the heart of London are receiving serious consideration by the City Lands Committee which is making a serious attempt to solve the problem of the centralization of British air communications. London's nearest airport is at least forty minutes from it and in order to retain the advantages and benefits of air transportation, it is felt that the erection of an enormous landing platform over the Thames River along the foreshore and above some of the existing riverside warehouses, will be practical and also cut down the time from the airport to the city.

THE INITIAL award of the British Gold Medal for Aeronautics was made to Captain G. de Havilland for his achievements leading to the advancement of the science of aeronautics. The medal was founded in 1933, following a request from Lord Amulree, when Secretary of State for Air, that the Royal Aeronautical Society recognize, by an award, the outstanding feats in aviation leading to an advancement in the science of aeronautics.

VACUUM OIL Company's Beechcraft visited in England recently, being the first plane of this type to be seen in that country. The plane, powered by a Jacobs 225 engine, is touring Europe and has already visited Scandinavia, Germany and Holland. Mrs. Amy Mollinson has the English agency for Beechcraft.

FURTHER APPRECIABLE increases in the number of letters outward bound by air from England are shown by recent figures. During the quarter ending June 30, 1934 airmail poundage totaled 61,300 as compared with 43,000 pounds for the corresponding period in 1933. Mail poundage increased 49 per cent on the England-South Africa service and 50 per cent on the England-Europe route.

Holland

K.L.M., the Royal Dutch Air Lines is at present engaged with specific plans for an airline from the Netherlands to the Dutch West Indies, via Dakar, Africa; Natal, Brazil and other various intermediate airports to Curacao in the Dutch West Indies. There it is expected Pan American Airways will tie in with them to establish a direct airline between Europe and the United States. From present indications, K.L.M. will fly Fokker XVIII's, powered by three Pratt & Whitney Wasp engines. The aviation department of the Shell Oil Company is analyzing this route with the idea of establishing necessary refuelling points.

Hans Schaller, Berlin

Planes entered in the Challenge de Tourisme at Templehof before flying to Paris

Mexico

PASSENGER, MAIL and express service has been started on an experimental basis between Merida and Belice, British Honduras by Cia de Transportes Aereos Mexicanos del Sureste. This is the only regular transportation service between Yucatan and British Honduras existing in Mexico at present.

MEXICAN AIR transport lines carried 1,596 passengers during July, according to reports of the aviation department of the Ministry of Communications and Public Works. Most of these passengers flew on the Mexico City-Brownsville route operated by Pan American Airways' Mexican division.

ONLY MEXICAN pilots will be in air transport positions in Mexico by 1936 it was learned in the Ministry of Communications and Public Works whose officials said that the new general communications and transport law demand nationalization of airways, as far as plane crews are concerned. Aviation companies have been advised of this provision and will be granted sufficient time to adjust themselves to it. Foreign pilots may continue to fly after the law is enforced, ministry officials said, but they will be required to obtain Mexican citizenship.

MEXICO HAS an airline network of 9,618 miles operated by 15 transport companies, President Abelardo L. Rodriguez's message to congress pointed out. The report said that the air network was increased by 2,600 miles from September 1, 1933, to August 31, 1934, and that during that period air communication companies had received government subsidies amounting to $23,000.

SERVICE BETWEEN Mexico City and Acapulco, a Pacific coast port resort, has been inaugurated by Aeronaves de Mexico, S. A. The one-way fare is $8.40, while express is being carried at approximately 7 cents per pound.

WITH NEW fields in service at Dzibalchen and Bolonchen, Compania de Transportes Aereos, S. A., is arranging to fly a regular passenger schedule between Merida, Holpchen and Campeche City.

Poland

CAPT. JERZI BAJAN and Stanislaus Ploncyzinski, both flying Polish R.W.D. planes equipped with Polish Skoda engines, finished first and second in the fourth international air race for sporting planes. Poland has now won the Challenge de Tourisme International a third time, two of them successively. Thirty-one planes started from Warsaw, and those that finished flew 5,900 miles and visited nine countries.

Germany, whose pilot Hans Seidemann placed third, also has won the event two successive times, and both she and Poland have an equal chance to gain permanent possession of the trophy in 1936.

Russia

TWO SOVIET dirigibles, the B-6 and B-7, are now under construction, the latter having a volume of 323,086 cu. ft. Its gondola is designed for a crew of six, in addition to a passenger cabin which accommodates ten. This ship will be equipped with two engines, totaling 700 h.p., and will have a cruising speed of about 75 m.p.h.

Considerable activity in dirigible construction is in evidence in the Soviet Union. The first semi-rigid dirigible (75,916 cu. ft.) was assembled and made its maiden flight last year. At the same time work was started on a semi-rigid ship of 653,235 cu. ft. capacity, now nearing completion, and another of 1,765,500 cu. ft., which is to be completed this year.

TASHKENT AND vicinity are being sprayed from planes, in efforts to rid the region of malaria mosquitoes. In Uzbekistan, Turkmenistan and Tadjikistan, more than 49,420 acres of swamp land have already been treated and 370,650 acres will be similarly sprayed during the year.

SEVERAL NOVEL ideas are found in the design of a new glider-ornithopter, now under construction at the Menzhinsky plant. The weight of the pilot is to be distributed so as to make movement of the wings a comparatively easy matter. The first model is expected to remain in the air 20 to 30 seconds, without losing altitude.

Sweden

LIEUT. THUNBERG, of the Royal Swedish Air Force just barely managed to outpoint Lieut. Clausen of the Danish Army in the 1000-mile Scandinavian Air Race held recently. Forty planes started the race and 33 finished.

TWENTY-EIGHT FIRMS were represented in the British Section of the International Aircraft Exhibition which opened at Copenhagen on August 17. Most are members of the Society of British Aircraft Constructors. Among the planes shown were three military and five commercial craft including the single-place Scimitar fighter, capable of a top speed of 225 m.p.h., one of the new Blackburn torpedo-spotter-reconnaissance planes, two autogiros and a Major.

Books For Sale by the Aeronautical Library

GENERAL

A Rabbit in the Air. *David Garnett*.....$1.50
Aeronautics, A General Text on. *Hilton B. Lush*.....$3.25
Andree's Story. *Edited by the Swedish Society for Anthropology and Geography*.....$5
Around the World in 28 Days. *Linton Wells*..$3.50
Aviation From the Ground Up. *Lieut. G. B. Manly*.....$3.50
Beauty of Flight. *Manfred Curry*.....$5
Flying. *James E. Fechet*.....$1
Heroes of the Air. *Chelsea Frazer*.....$2.50
Learning to Fly. *Capt. C. D. Barnard*.....$5.50
Learning to Fly for the Navy. *Lieut. Barrett Studley*.....$2
Little America. *Richard E. Byrd*.....$5
Mechanics of Flight. *A. C. Kermode*.....$2.50
Pseudo-Security. *J. M. Spaight*.....$5
Seaplane Solo. *Francis Chichester*.....$2.50
Strategy and Tactics of Air Fighting. *Major Oliver Stewart*.....$2.25
The Book of the Autogiro. *C. J. Sanders & A. H. Rawson*.....$1.75
The Book of the Sky. *Matthew Luckiesh, D.Sc.*.....$3
The Conquest of the Atlantic by Air. *Charles Dixon*.....$2.50
The Far Horizon. *Henry Wysham Lanier*...$3
The Old Flying Days. *Maj. C. C. Turner*....$7.50
The Red Juggernaut (Nat'l Defense). *L. R. Maxwell*.....$1
The Sky's the Limit. *Lt. Tomlinson*.....$3.50
The Standard Airpost Catalogue. 1931-32 Edit..$2
The Story of Aircraft. *Chelsea Fraser*.....$2.50
The War in the Air. *W. Raleigh & H. A. Jones.*
Volume 1, 2, and 4, each.....$7
Volume 3.....$9
The World in the Air. *Francis Trevelyan Miller* (2 volumes).....$15
Up. *Jack Stearns Gray*.....$3
Wings of Tomorrow. *Juan de la Cierva & Don Rose*.....$2.50
Wings for Men. *Frank Wead*.....$4
Wings Over the World. *J. L. French*.....$1

ELEMENTARY

A B C of Aviation. *Capt. V. W. Page* (new edition).....$1
A B C of Flight. *Laurence LePage*.....$1.50
Aerobatics. *H. Barber*.....$3.50
Elements of Aviation. *V. E. Clark*.....$3
Elementary Aeronautics. *A. P. Thurston, D.Sc.*$2.50
Elementary Aeronautical Science. *J. B. Hart & W. Laidler*.....$2.50
Elementary Laboratory Aerodynamics. *Arthur L. Jordan*.....80c
How to Fly. *Barrett Studley*.....$3
Manual of Flight. *Ienar E. Elm*.....$3
Practical Flight Training. *Lieut. Barrett Studley, U.S.N.*.....$5
Practical Flying. *Byron Q. Jones*.....$3
Simplified Aerodynamics. *Alexander Klemin*..$3.50
Skyways. *General William Mitchell*.....$3
The Airplane. *Frederick Bedell*.....$3
The Complete Airman. *Capt. G. C. Bailey*....$5

DESIGN, CONSTRUCTION, OPERATION

Aeroplanes, Seaplanes and Aero Engines. *Capt. P. H. Sumner*.....$4
Aircraft Float Design. *Holden C. Richardson, M.S.*.....$5
Airplane Mechanics' Rigging Handbook. *R. S. Hartz*.....$3.50
Airplane Pilot's Manual. *Ross Mahachek*.....$2.50
Airplane Welding. *J. B. Johnson, M.B.*.....$3.50
Airplane Structures. *Alfred S. Niles & Joseph S. Newell*.....$5
Marine Aircraft Design. *Wm. Munro*.....$4.50
Metal Aircraft Construction (revised edition). *M. Langley*.....$4.50
Oxy-Acetylene Welders' Handbook. *M. S. Hendricks*.....$3
Procedure Handhook of Arc Welding, Design & Practice.....$1.50
Screw Propellers (3rd Edition, 2 Vols.). *Chas. W. Dyson*.....$5

ENGINEERING

Aerodynamic Theory. *W. F. Durand*.....$7
Airplane Stress Analysis. *Alexander Klemin*..$7
Dynamics of Airplanes and Airplane Structure. *J. Younger & B. Woods*.....$3.50
Elements of Aerofoil and Airscrew Theory. *H. Glauert*.....$5.60
Engineering Aerodynamics. *W. S. Diehl*.....$7
Fundamentals for Fluid Dynamics for Aircraft Designers. *Dr. Munk*.....$8
Handbook of Aeronautics. *Royal Aeronautical Society*. Vol. 1.....$7.50
Principles of Aerodynamics. *Dr. Max M. Munk*.....$1.75
Principles of Flight. *Edward A. Stalker*.....$6
Simple Aerodynamics and the Airplane (4th revised edition). *Col. C. C. Carter*.....$4.50
Stresses in Aeroplane Structures. *H. B. Howard*.....$5

ENGINES

Aircraft Engine Instructor. *A. L. Dyke*.....$5
Aircraft Engine Mechanics Manual. *C. John Moors*.....$4.50
Aviation Engine Examiner. *Major V. W. Page*.$3
Automohile and Aircraft Engines. *A. W. Judge.* (Revised).....$10
Aviation Chart. *Lt. V. W. Page*.....30c
Diesel Handbook. *Julius Rosbloom*.....$5
Engine Dynamics and Crankshaft Designs. *Glenn D. Angle*.....$4
Handbook of Aeronautics, *Vol.* 2.—Aero Engines, Design and Practice. *Alexander Swan*.....$4.50
High Speed Diesel Engines. *Arthur W. Judge*.$4
Modern Aviation Engines. *Victor W. Page* (2 volumes), *per volume*...$5
Set of 2 volumes.....$9
Modern Diesel Engine Practice. *Orville Adams*.....$6
Principles and Problems of Aircraft Engines. *Minor M. Farleigh*.....$3

FICTION

Night Flight. *A de St.-Exupery*.....$1.75
Sky Larking. Bruce Gould.....$2.50
The Right to Solo. *R. W. Kessler*.....$2
The Rise and Fall of Carol Banks. *E. W. Springs*.....$2.50
Wonder Book of Aircraft. *Harry Golding, F.R.G.S.*.....$2.75

GLIDERS

A B C of Gliding and Sailflying. *Maj. V. W. Page*....Cloth binding, $2; paper, $1
The Book of Gliders. *E. Teale*.....$1
Gliders and Gliding. *R. S. Barnaby*.....$3

HISTORICAL

A Narrative History of Aviation. *John Goldstrom*.....$4
Beginning of Organized Air Power. *J. M. Spaight*.....$7
Evolution of the Flying Machine. Balloon: Airship: Aeroplane. *H. Harper*.....$5
Historic Airships. *R. Sargent-Holland*.....$4
Minute Epics of Flight. *Lumen Winter & Glenn Degner*.....$1
Sky Higb. *E. Hodgins & F. A. Mogoun*....$2.50
The Ingenious Dr. Franklin. *Nathan G. Goodman*.....$3
The Problem of Vertical Flight. *Parlee C. Grose*.....$1.50
Wings Over Poland. *Kenneth M. Murray*....$3

INSTRUMENTS

Blind Fligbt. *By Maj. Wm. C. Ocker & Lieut. Carl J. Crane*.....$3
Instrument Flying. *Howard Stark*.....$2
Measurement of Fluid Velocity and Pressure. *J. R. Pannell*.....$4

LANDING FIELDS AND AIRWAYS

Air Conquests. *W. J. Davis*.....$3

LEGAL AND MEDICAL

Aeronautical Law, with 1933 Supplement. *W. Jefferson Davis*.....$12.50
Aircraft and Commerce in War. *James M. Spaight*.....$2.25
Aircraft and the Law. *Harold L. Brown, LL.B.*$3
Aircraft Law—Made Plain. *George B. Logan, A.B., LL.B.*.....$3
Aviation Law. *Henry G. Hotchkiss*.....$7.50
Law of Aviation. *Rowland W. Fixel*.....$7.50
National Regulation of Aeronautics. *Chas. C. Rohlfing, Ph.D.*.....$3
The Law in Relation to Aircraft. *L. A. Wingfield, M.C., D.F.C., & R. D. Sparks, M.C.*.....$5
U. S. Aviation Reports, 1932.....$10
Aviation Medicine. *L. H. Bauer, M.D.*.....$7.50

MATERIALS

The Materials of Aircraft Construction. *F. T. Hill*.....$5
Manufacture and Use of Plywood and Glue. *B. C. Boulton*.....$2.25
Metallurgy of Aluminum and Aluminum Alloys. *Robert J. Anderson*.....$7.50
Engineering Materials (Volume I) Ferrous. *A. W. Judge*.....$8.50
Engineering Materials (Volume II) Non-Ferrous and Organic Materials. *A. W. Judge*..$7.50
Engineering Materials (Volume III) Theory and Testing of Materials. *A. W. Judge*....$6

MODEL AIRPLANES

Beginners' Book of Model Airplanes. *C. H. Claudy*.....$1.75
Building and Flying Model Aircraft. *Paul Edward Garber*.....$2.25
Complete Model Aircraft Manual. *Edwin T. Hamilton*.....$3.50
Miniature Aircraft. How to Make and Fly Them. *O. H. Day & T. Vincent*.....80c
Model Airplanes. *Joseph Ott*.....$2.50
Prize Winners' Book of Model Airplanes. *C. H. Claudy*.....$3
The Skycraft Book. *Laura B. Harney*.....$1.25

NAVIGATION AND METEOROLOGY

Aerial Navigation & Meteorology. *Lewis A. Yancey* (new edition).....$4
Aeronautical Meteorology. (Revised edition). *W. R. Gregg*.....$4.50
Aircraft Radio. *Myron F. Eddy*.....$4.50
Air Navigation and Meteorology. *Capt. Richard Duncan, M.C.*.....$3
Air Navigation for Private Owners. *F. A. Swoffer, M.B.E.*.....$2.25
Altitude & Azimuth Tables for Air & Sea Navigation. *Collins & Roden*.....$2
An Analysis of Meteorology. *Harold Lewis Kirby*.....$4
Avigation by Dead Reckoning. *Captain Ienar E. Elm*.....$2
Cloud Studies. *A. W. Claydon, N.A.*.....$4.50
Force of the Wind. *Herbert Chatley*.....$2
Line of Position Book. *Lt.-Com. Weems*....$2.50
Man and Weather. *Alexander McAdie*.....$2
Meteorology for Aviator and Layman. *Richard Whatham*.....$3
Navigation and Nautical Astronomy. *Capt. B. Dutton*.....$3.75
Simplified Aerial Navigation. *J. A. McMullen*.....$2
Simplified Time Chart of the World. *Chas. M. Thomas*.....25c
The Navigation of Aircraft. *Logan C. Ramsey*.$4.50
The Navigation of the Air and Meteorology. *Capt. Leslie Potter*.....$4
Weather. *E. E. Free and Travis Hoke*.....$3
Weather and Why. *Capt. I. E. Elm*.....$2.50

PARACHUTES

Jump. *Don Glassman*.....$3
Parachute. *Charles J. V. Murphy*.....$2.50
Parachutes for Airmen. *Chas. Dixon*.....$2.50

PHOTOGRAPHY

Aerial Photographs. *Lt. Reeves, A.C.*.....$5
Airplane Photography. *H. B. Ives*.....$4
Applied Aerial Photography. *Capt. Ashley C. McKinley*.....$5
Multiple Lens Aerial Cameras in Mapping. *Fairchild Aerial Camera Corp*.....$5

TRANSPORT & COMMERCIAL AVIATION

Economics of Air Mail Transportation. *P. T. David*.....$2
An Introduction to the Economics of Air Transportation. *Kennedy*.....$2
Principles of Transportation. *E. R. Johnson, G. G. Hubner and G. L. Wilson*.....$5
Transport Aviation (2nd Edition). *Archibald Black*.....$4

ELEMENTARY (GENERAL)

Dick Byrd—Air Explorer. *Green*.....$1.75
Everyman's Book of Flying. *Orville Kneen*..$3.50
Fighting the Flying Circus. *Capt. Eddie Rickenbacker*.....$2
Flying and How to Do It. *Assen Jordanoff*...$1
If You Want to Fly. *Alexander Klemin*.....$2.50
Riders of the Winds. *Edward Shenton*.....$2.50
Skycraft. *Augustus Post*.....$3.50
Skyward. *Commander Richard E. Byrd*.....$3.50
The First World Flight. *As related by the fliers themselves to Lowell Thomas*.....$5

BALLOONS AND AIRSHIPS

Aerostatics. *E. P. Warner*.....$4
Airship Design. *Charles P. Burgess*.....$9
Balloon and Airship Gases. *C. deF. Chandler & W. S. Diehl*.....$4
Free and Captive Balloons. *R. H. Upson & C. deF. Chandler*.....$5
Men Working. *Norman Beasley*.....$3
Pressure Airships. *T. L. Blakemore & W. Watters Pagon*....$8
Up Ship! *Lt. Comm. C. E. Rosendahl*.....$3

YEAR BOOKS

All the World's Aircraft. 1933—*Jane's*.....$14.75
Junior Aircraft Year Book for 1934.....$1.50

Prices Include the Postage

AERO DIGEST • 515 Madison Avenue • New York

Remit by Money Order or Check

PILOTING FOR PROFIT

(*Continued from page 17*)

siderably more than is gained when cruising correspondingly below the required average. As a further example, if the engine r.p.m. are increased so as to get ahead of schedule and then throttled down to land on time, the amount of fuel consumed will be more than that used if the r.p.m. throughout the flight are maintained at the same speed. In general, under calm conditions or light winds, the pilot will operate more economically by cruising throughout the flight at the lowest r.p.m. consistent with maintaining the schedule. It must be remembered that the drag increases as the square of the speed and that the power and likewise (within the cruising range) the fuel consumption increase as the drag which they overcome.

Comparatively little attention is paid by the average pilot to the most economical altitude at which to fly. A careful pilot will strictly heed his upper air reports and endeavor to choose an altitude with the wind, provided that visibility, clouds, air smoothness, etc., do not interfere. Weather reports, however, are not complete enough to be the last word in deciding the most favorable altitude. The pilot should observe the clouds and smoke, note when the wind changes and, if necessary, change his altitude correspondingly. If necessary to climb through a head wind to a more favorable wind above, it is best to climb fairly steeply without running the engines wide open, thereby getting through the head wind and into the tail wind with the least possible delay. The same method applies in descending for a landing through a contrary wind. If there is a head wind and a tail wind available on the pilot's course the more time he spends with the tail wind and the less in the head wind the more economical will be his flight. Some experienced pilots claim that it is best to cruise at a fixed r.p.m. even though it brings them to the end of the flight ahead of schedule, because a shorter time in the air saves the most fuel. In general, it will be found that with due attention to the scheduled departure and arrival time, the more slowly the plane can be cruised and still kept on schedule, the less will be the fuel and oil consumption and engine wear. The practice of cruising at or above normal cruising speed under all conditions so as to fly from one stop to the next in the shortest time will be found uneconomical, particularly if the engine is idled on the ground during the extra time saved in the air.

With practically all transport planes, and especially with those equipped with supercharged engines, it is far more economical to fly at high altitude. Assuming the wind identical near the surface and above eight thousand feet (which is rarely the case) it will be found more efficient and usually more comfortable to fly at eight, ten or twelve thousand feet than at one, two or three thousand feet, provided that the service ceiling is well above the cruising altitude so that the climb can be made easily, and provided also that the flight is of sufficient duration to warrant the climb. The economy of fuel consumption when engines are leaned, the cooler head and oil temperatures, the lessened strain on the superchargers and their gears, and the greater passenger comfort, are factors tending to increase the economy and efficiency of operation at higher altitudes.

Smoothness in handling a plane, both on the ground, on water and in the air, reduces unnecessary wear and tear on the plane and engine. In landing, some pilots use the brakes in an unnecessarily rough manner, resulting in extra wear on tires and landing gear and discomfort to passengers.

The use of the controls when in rough air must also be considered. Some pilots, most frequently young pilots, "fight" the controls, keeping the ailerons and rudder in continual motion in order (as they believe) to minimize the effect of air bumps. In rough air a certain amount of movement of the controls is necessary but it will be found that the correct amount is much less than many young pilots believe. They will frequently over-control so that they are in reality making the bumps worse. Excessive and continuous movement of control surfaces decreases the air speed to an appreciable degree and results in extra wear and tear on the control system.

A further factor which is neglected to varying degrees is the synchronization of engines of multi-motored planes. Perfect synchronization is important not only for comfort, but also (and particularly in all-metal planes) to decrease vibration and consequently lengthen the life of the plane and engine.

Proper use of the mixture control is a most effective means for cutting down fuel consumption. With careful attention, a pilot may use his mixture control at any altitude without danger of injury to engines, especially if the engines are equipped with cylinder temperature indicators. It is often heard that the mixture should never be "leaned out" at altitudes lower than 5,000 feet, but this rule was made years ago when aviation fuel was of a poor quality compared to that available today. With care there is little liability of ill effects from leaning out the mixture when the plane is in level flight. It is probably inadvisable to have the engine leaned out in a steep climb because of the possibility of overheating. Also it is best to have the mixture full rich when landing and taking off on account of the possibility of an engine stoppage at those times.

WEATHER MAP READING

(*Continued from page 22*)

toward the nearest or the strongest low pressure area. "Highs" occupy much larger areas than "lows" and have been known to cover the entire country, generally traveling at the rate of about twenty-five miles per hour. Highs which follow a low usually indicate clearing weather; lows which follow a high usually indicate unsettled weather.

A low pressure area is one of low barometer, with more or less circular isobars, though in some cases they may assume "V" or wedge shapes. The winds follow the isobars inward in an anti-clockwise direction. The diameters of "lows" in the United States vary from about one thousand to fifteen hundred miles, and these areas will be seen to follow the general trend of surface isotherms, moving at about 27 or 28 miles per hour.

It is the dewpoint that warns of a fog possibility. This observation gives the temperature at which the air would be saturated with moisture, under the present conditions of temperature, humidity and pressure. If the temperature is greater than the dewpoint by seven degrees or *less,* there is danger of fog in the locality. It is advisable to heed the dewpoint reading when checking weather reports, even when the forecast for the next twelve hours is at hand for each of the localities coming within the projected itinerary.

Only the four principal cloud forms are really necessary for the average pilot. The Cirrus, Cumulus, Nimbus and Stratus are the basic types, the other cloud formations being practically always made up of combinations of these four. The Cirrus, generally the highest in the sky with a normal altitude of 25,000 feet, are white clouds, generally detached in the form of soft tufts, although they may appear as long stretches across the ceiling. Cumulus are the billowy white wool-pack clouds that are so common. They have the thickest known dimensions, averaging approximately 2,400 feet in thickness. They appear as large patches, but in high winds become broken up into small portions, which are called Fracto-Cumulus. The normal altitude of the Cumulus is about 5,000 feet. Nimbus, the rain cloud, is seen as thick layers of dark masses without any apparent shape, and with ragged edges, from which rain or snow is generally falling. If Nimbus clouds separate into shreds, or if small loose clouds are visible floating underneath large Nimbus, they are commonly called "Scud." The usual altitude for the Nimbus is 6,000 feet or less, and their thickness runs in the neighborhood of 1,000 feet. The lowest cloud formation is the Stratus, which often reaches to the ground, and is never higher than 3,000 feet. The sky is generally completely overcast, and the visibility is always poor.

Pilots whose ships are equipped with radio can always get the latest reports on local weather while in flight, but unless they know at least some facts about meteorology, the broadcasts will probably tend to confuse them. They should gather more than the "zero-zero" that the phones tell them to be fully aware of the advisability of sitting down, going ahead or turning about.

PERSONAIRLITIES

(*Continued from page 26*)

In 1911 the movie business arrived in Hollywood, but Elmer kept right on making church windows and bar fixtures until 1915, when with a friend he purchased a movie camera and became a producer. He's one of the few cinematographers who started as a producer and finally worked up to cameraman. He and his friend took the picture of an automobile road race and booked it around Los Angeles; then he took pictures of Burbank's spineless cactus—no relation to Hiram Bingham, sometimes referred to as belonging to the same general species. As a steady job, (the glass business having gone into a slump) Elmer became an assistant set-designer and dresser at Universal studios, suddenly working into the studio camera end. The war was on, and the cameraman who was shooting a Texas Guinan picture was drafted to go over to Europe and look silly, with the rest of us. In desperation the Director asked Elmer to take a shot at Texas with his spineless cactus and road race camera. Elmer did this amazingly well and so pleased Texas and the Director, Henry MacRae, that he was retained to make the rest of Miss Guinan's pictures. Elmer decided to keep on with studio camera work, so 1919 found him associated with Milton Moore, A.S.C., on what I believe was the first air picture, The Great Air Mail Robbery, (in a recent revival of which Jim Farley played the part of the villain, to loud hoots of derision.)

Well, as it happened, Milton Moore had a weak stomach; he simply couldn't do the aerial camera work on this picture, starring Lt. Omar Locklear in his famous plane change. So Elmer Dyer, his assistant, had to do the air sequences on the whole production, which became a sensational success for those days. I recall hearing about it in England, or it may have been in Germany with the Army of Occupation. Anyhow, all of us R.A.F. pilots decided that it must be trick photography, for nobody could change from one plane to another in the air! We couldn't believe it.

A plane-to-plane change is a matter of fact procedure these days, but think of the nerve of the first man to attempt the stunt. With a word of sincere thanks to William Stull, A.S.C., who has favored me with the facts of Elmer Dyer's biography, which I have garbled in my usual nit-wit fashion, I want to end this with a quotation from Bill's letter. "As nearly as I can find out," he writes, "Locklear was the *first* man to do a plane-to-plane change in the air. Both Elmer Dyer and Dick Grace corroborate this, as do some of my friends who were at Brooks and Kelly Fields during the war. Omar Locklear, Skeeter Elliott and a third pilot identified only as Shorty, or Lieut. Short" (can this be Shirley Short? Cy) "worked it out as a pastime there at Kelly Field. Locklear would go up in one plane—usually with Elliott—make the change to Short's plane in the air, and come down in Short's ship. Dick Grace has stated that he has seen Locklear take off standing on the wing of Elliott's ship and be climbing the ladder to Short's ship before Elliott had reached the end of a 1,000 foot runway. There was no fake or camera trickery.

"Elmer was grinding a camera on the ground when Locklear was killed. It was a night scene, and the script called for Locklear to spin down from 5,000 feet with his plane covered with a phosphorous paint compound, to simulate flames. A battery of powerful arc-lights played upon the plane from below to illuminate it for the cameras. Locklear and Elliott went up to do the stunt. At 5,000 feet they went into a perfect spin—and they kept on spinning."

So ended the first of the famous stunt men, with Elmer Dyer grinding the camera, as he also has ground it in most of the crack-ups which have made Dick Grace famous. One of them was one of the few in which Grace lost control and didn't crack up exactly on the mark. In that one the plane veered, headed straight for Elmer and his camera, and piled up less than 30 feet from where Elmer stood. When the dust settled down, where was Elmer? Well, he was right there, still casually grinding away, getting the last fragments. You couldn't stop him. Bill Stull tells me that Dick Grace has described Elmer Dyer as "the nerviest, most daring individual who ever cranked a camera."

ADVERTISERS' LITERATURE SERVICE

AIRCRAFT

Literature on the following available to dealers, operators, private owners, business houses:

1. BEECHCRAFT — Four- or five-place, high performance cabin; 225 to 690 h.p. . . Page 51

2. FAIRCHILD — Two - place, open and three-place cabin, high wing . . . . . Page 79

3. LAMBERT—Two-place, high wing, cabin; choice of several engines . . . . . Page 53

4. LUSCOMBE—High performance, two-place, metal, cabin. Page 62

5. TAYLOR — Two-place, high wing, tandem open cockpit, less than $2,000 . . . . . Page 63

7. WACO—Complete line open and cabin planes, biplane models, wide range of engines. Page 75

Literature on the following available to United States and foreign airline operators and military authorities:

8. BOEING "247" — High speed, all metal, low wing, passenger, mail and express plane. Two engines; 10 passengers and crew . . . . . Page 33

9. DOUGLAS—High speed, all metal, low wing, passenger, mail and express plane. Two engines; 12 passengers and crew. . Page 6

10. GRUMMAN — Single engine, high performance Scout and Amphibion planes doing service in U. S. Navy. . Page 8

11. CONSOLIDATED — Long range patrol flying boats, two engines, holders of non-stop over-water mass formation flight record . . . . . Page 1

12. BELLANCA — Aircruiser and Seacruiser, single-engined heavy load carriers. . . . Page 27

13. VOUGHT—"Corsair," single-engine, high performance Navy plane; also serving in foreign counties. . . . . Page 55

ENGINES

Literature on the following available to aircraft manufacturers, engineers, designers, airline officials and other users of high-powered aircraft engines, Army and Navy officials, etc.—here and abroad:

14. PRATT & WHITNEY — Wasp and Hornet series air-cooled engines; direct drive, geared, supercharged. Back Cover

15. WRIGHT—Whirlwind and Cyclone air-cooled engines; direct drive, geared, supercharged; also Conqueror series, liquid-cooled engines . . . Second Cover

IMPORTANT

For the convenience of those who are in the market for any of the products or facilities advertised in this issue. Read carefully, before filling out the coupon, the advertising of the items in which you are interested. Be sure to mention the company with which you are associated, and your position.

AIRCRAFT & ENGINE EQUIPMENT

Additional data on the following available to manufacturers, engineers, designers, operators, repair stations, government air services, etc.; also to aircraft owners in the market for replacements:

16. BERRY BROS. — Aircraft dope, lacquers, high grade finishes . . . . . Page 67

17. B. G.—Spark plugs, mica; regular and radio shielded types. Page 2

18. THOMPSON—Intake and exhaust valves; hollow head and stem type, and cupped head and solid stem . . . . . Third Cover

19. B. A. 30—Balloon and airplane cloth, made by Wellington Sears Co. Grade A, meets all Army and Navy spec. . Page 75

20. WITTEK—"Noc-out" hose-clamps, with thumb screw, insure tight connections. . . . . Page 67

21. EVANS — Aircraft fuel pumps; spring loaded flexible sylphon seal, flexible shaft, integral relief valve, wabble pump bypass . . . . . Page 73

22. FLEETWINGS — "Shotweld" system stainless steel construction; "shotweld" stainless steel gasoline tanks. . . . Page 71

23. GOODRICH—"Silvertown" airplane tires; 40 other rubber products for aircraft. . . . Page 47

24. HAMILTON STANDARD —Controllable pitch steel propellers . . . . . Page 25

25. KOLLSMAN—Precision aircraft instruments, individual direct lighting, clamp-type mounting . . . . . Page 3

26. MACWHYTE—Streamline, square and round tie rods; cable; slings . . . . . Page 51

27. AEROMARINE — Aircraft instruments, part of the equipment of Roy Minor's Brown Special, winner at the 1934 National Air Races. . . . . Page 67

28. GOODYEAR — Airwheels and Hydraulic Airwheel Brakes; other rubber products. Page 23

29. HURLEY-TOWNSEND — "Cooled," radio-shielded aircraft spark plugs; all engines. Page 72

30. JADSON—Valves, standard equipment in the high speed Menasco engines . . . . . Page 67

31. PIONEER—Flying and navigation instruments; complete panels, individual instruments. Page 31

32. VELLUMOID—Fibre Sheet Packing for gaskets, water-tight, etc. . . . . Page 53

MISCELLANEOUS

The following companies will gladly send their literature to those who are interested in the particular products advertised:

33. AMERICAN—Steel sheets, the product of American Sheet & Tin Plate Co., for hangers, shops, sheds, culverts. . Page 71

34. LYMAN—The Cutts Compensator for hunting, skeet, traps. Product of the Lyman Gun Sight Corp. . . . . Page 67

35. WESTPORT — Long-range aircraft radio receivers; also ground station radios. Distributed by Pacific Air. Corp. Page 74

36. RONALD — The Ronald Press library contains 28 technical and non-technical aviation books of value to students, pilots, mechanics and engineers. Page 88

37. KELLETT—Aerial advertising; franchises available to qualified individuals or organizations. Page 75

38. N-B—Nicholas-Beazley offers complete line of winter flying clothing. . . . . Page 49

39. PACIFIC AIRMOTIVE — West Coast representatives for large variety of prominent aircraft accessories. . . . . Page 59

40. RCA VICTOR — Aircraft Radiobeacon Receiver and other aircraft radio equipment. Page 43

41. IDEAL — Model aircraft, complete kits, supplies. Page 71

42. TROMMER-M.-F. — German gliders and soaring planes. Dealers wanted. . . . . Page 75

SCHOOLS

School literature is available to everyone contemplating a course in aeronautical training:

44. BOEING—Oakland, Calif. Courses include: Master Pilot, Special Master Pilot, Airline Operations, Ltd. Com. Pilot, Private Pilot, Amateur. Page 75

45. DALLAS — Dallas, Texas. Courses include all classes of pilot and mechanic training, aviation radio . . . . . Page 9

46. CASEY JONES—Newark, N. J. Courses include: Aeronautical engineering, mechanics, instrument flying . . . . Page 53

47. LINCOLN—Lincoln, Neb. Courses include all grades of pilot, and mechanic. . . . Page 71

48. PARKS—East St. Louis, Ill. Courses include: Executive Transport Pilot, Aeronautical Engineering, A & E Master Mechanics, Ltd. Com. Pilot, A & E Mechanics . . . . . Page 5

49. RYAN—San Diego, Calif. Courses include: All grades of pilot and mechanic training; aerial navigation . . . . . Page 7

50. ROOSEVELT — Mineola, N. Y. Courses include: Amateur, Private, Ltd. Com., Transport Pilot; regular and Master Mechanics . . . . . Page 63

51. SPARTAN — Tulsa, Okla. Courses include: Flying, mechanics, radio-instrument, executive-management . . . . . Page 57

52. STEWART — New York, N. Y. Specializes in airplane engine master mechanics. Page 67

53. TRI-STATE—Angola, Ind. Two-year aeronautical engineering course . . . . . Page 84

54. BOEING — Home study courses in communications, power plants, aircraft, avigation, meteorology, instruments. Page 51

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number.

CHECK HERE:

No. . . . . Name . . . . .

No. . . . . Position . . . . .

No. . . . . Company . . . . .

No. . . . . Address . . . . .

No. . . . . City and State 10-34

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

San Fernando & Raymond - - Glendale, Calif.
LIEUT. W. S. HAWKINS
AIR-PARTS 70-85% OFF
A DEPENDABLE COMPANY

All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velie, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

BOSCH BOOSTERS!

Brand New Bosch Booster Magnetos!
Regular Price, $25
We have a small stock of them at
ONLY $7.50 EACH
Supply Division, Inc. Robertson, Missouri

STAINLESS STEEL TIPPED
PROPELLERS
FLOTTORP PROPELLER CO.
1836 Linden Ave., S. E.
Grand Rapids, Michigan

ATTRACTIVE STORAGE RATES

for aircraft in modern fireproof hangars, $15 per month and up (dead storage $10 and up). Aircraft and Motor Repairs done at low cost. Why not drop in at Boston's Convenient Airport and get acquainted?

NATICK-WELLESLEY AIRPORT
Boston-Worcester Turnpike NATICK, MASS.

Phenix Clear Nitrate Dopes

Clear—$1.05 per gal. in 50 gal. Drums Included
—$1.10 per gal. in 30 gal. Drums Included
—$1.20 per gal. in 5 gal. boxed cans
Pigmented—$1.90 per gal. in 5 gal. boxed cans
Yellow, Blue, Green, Cream, Khaki, Aluminum, Black, White. Immediate shipments fresh high grade.
"Send ½ the cost with C. O. D. shipments"
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

N. A. C. A. Cowling Specialists
METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter
MAGOSY & BUSCHER
120-126 Walker Street, New York, N.Y.

Research
Design
Stress-Analysis

Manufacturing
Flight-Testing
Operations

GRANVILLE, MILLER & DE LACKNER
CONSULTING
AERONAUTICAL ENGINEERS
SPRINGFIELD AIRPORT, SPRINGFIELD, MASS.

Royal E. Burnham
Attorney-at-Law
Patent and Trade Mark Causes
511 Eleventh St., N.W., Washington, D.C.

---

selected clear aero sitka
SPRUCE

For quick shipment from Chicago, rough or finished to exact size. For airplanes, gliders, iceboats, etc.
Lowest Wholesale Prices

Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.

Come to Us for Good Spruce
PIKE-DIAL LUMBER CO.
Airplane Lumber Specialists—2251 Leomis St., Chicago
We also carry "Plycer" aircraft plywood

AERONAUTICAL RADIO CO
ROOSEVELT FIELD MINEOLA N. Y.
Telephone Garden City 6770
Radio Shielding for all types of motors; Western Electric Aircraft Radio; Hurley-Townsend Radio-Shielded Plugs; Westport Aircraft Radio; Transmitting Equipment.

AERO BLUE BOOK

gives specifications of over 350 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Also present second-hand market value of popular ships. Only information of its kind ever compiled. Almost priceless to students, engineers, dealers and flyers. FREE! If you order now, your choice "How to Choose a Flying School" or "Points on Buying a Used Airplane." Send now!
NATIONAL DISTRIBUTORS,
922 Pine St., St. Louis, Mo.
$1.00 postpaid.

PARTS
NEW AND USED
ENGINES • 60% to 80% Off • ACCESSORIES
Write for complete list
AIRPLANE PARTS AND SUPPLIES, INC.
1416 N. San Fernando Rd., Glendale, Calif.

"ON THE MARKET"

THE Sportsman Pilot's "On the Market" page will carry your used plane advertising to one of the wealthiest groups of men and women in the country—the private pilots. The advertising cost is low—only $5 per column inch (2" wide by 1" or more deep).

THE SPORTSMAN PILOT
515 Madison Ave. New York, N. Y.

AERO ENGINE
Parts and Accessories Bought and Sold

Parts for all engines at lowest prices. Also complete engines, overhauled and in need of overhaul. Propellers, generators, starters, etc. New OXX-6 cylinders, $1.50 each. Parts for large and small engines. All types of engine accessories and estimates.

AIRCRAFT SALVAGE COMPANY
21-75 48th St., Astoria, L. I., N. Y.

J-5 SPECIALS

Cylinders, $15, set $100; Pistons, $4; Rocker Arms, $2; Valves: Intake, $2; Exhaust, $4; Carburetor, $25; Master Rod, $25; Con Rod, $4; Crankshaft, $25; Crankcases, main, $75; intermediate, $25; rear, $30; Oil Pump, $12; Fuel Pump, $10; CC Acces. Drive Gear, $7; Carb. Heater and Screen Assem., new, $12; Rocker Boxes, $3; Pins, $1.

Large assortment Wasp, Hornet, Cyclone, Kinner, Eaglerock Parts and Instruments. Let us quote.

DYCER AIRPORT
9401 So. Western Avenue Los Angeles, Calif.

UNIVERSAL PROPELLERS

Special price on few test props, $24.50; used K-5 Hartzell, OX-5 and Velie M-5.
All guaranteed in perfect condition

UNIVERSAL AIRCRAFT SUPPLY CO.
2300 N. 9th Street St. Louis, Mo.

NEW AND USED ENGINE PARTS
(Write for our discounts first)
Kinner • Warner • J-5 • J-6 • Velie • Cirrus
COMPLETE AVIATION SUPPLIES

Flottorp wood props; steel blades and hubs; semi-air wheels; magnetos; carburetors; Pioneer instruments; fabric and dope at discounts.

CAMDEN AIR SUPPLIES
6307-09 Westfield Ave. Camden, N. J.

A COMPLETE LINE
TITANINE
THE WORLD'S PREMIER
DOPE
TITANINE, INC.
MORRIS & ELMWOOD AVES.
Union, Union Co., N. J.

MAX M. MUNK
Registered Patent Attorney

Grad. Mech. Engineer
Doctor of Engineering
Ph.D.
Member Virginia Bar
Technical Author

Rendering professional service of highest standard to government and private parties here and abroad since 1915.

1734 Eye St., N. W. Washington, D. C.

FOR SALE

MISCELLANEOUS
36 Airplanes
26 Engines
Lights—landing, navigation
Fuel Pumps
Generators G1-G2
Oil and Fuel Line Fittings
Oil Reclaimers
Safes
Instruments
Starters and Parts
Propellers and Parts
Plywood (3-Ply Birch)
Goodyear Airwheel Parts

Aircraft Cable
Radio Receivers
Radio Parts R.C.A., W. E., S. C.
Tools and Shop Equipment
AIRPLANE PARTS
Stinson Parts—
Models "S" Jr., SM1-D, SM6-B, SM6000-B
Ford Airplane Parts—
5 AT
Fokker Parts—
S. U. and F10A

Travelair Parts—
(Model 4000)
Stearman Parts—
(C3B-C3MB-4CM1-LT1)
Pitcairn Parts—
(PA5-6-7)
Fairchild Parts—
(FC2-FC2W2-71)
Bellanca Pacemaker Parts
Pilgrim Parts—
(100A and 100B)

ENGINE PARTS
Wright Engine Parts—
J-6-5, 7, 9, and J-5 Cyclone E. Gypsy
P & W Engine Parts—
Wasp B & C—Wasp Jr. Hornet A-A1-A2-B-B1-C
Kinner Engine Parts—
K5-B5-C5
Ignition Harness—
Shielded and Unshielded
Spark Plugs
Magnetos and Parts
Carburetors and Parts

This is not a complete list. Additional equipment is being constantly received.
Descriptive price lists mailed immediately upon request covering class of stock in which you are interested.
Reasonable prices. New engine parts 50% off list—used parts 80% off list.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED
Please order by part number where possible.

American Airways, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

SACRIFICE SALE

PLANES
ENGINES-PARTS

5 Fords
7 Fleetsters
4 Fokker F-10's

- Wasp Parts
- Hornet Parts
- Stromberg Parts
- Eclipse Parts
- Scintilla Parts
- Plane Parts
- Misc. Supplies

Detailed List and Price Furnished on Request

Transcontinental & Western Air
10 Richards Road
Municipal Airport
KANSAS CITY, MISSOURI

ENGINES

PARTS AND ACCESSORIES BOUGHT—SOLD
Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasco, etc. Also starters, generators, propellers, instruments, wheels and parachutes.
WRITE FOR PRICE LIST FRANK AMBROSE
AERO SALVAGE CORP.
Glenn Curtiss Airport, Jackson Heights, N. Y.

AIRPLANE ENGINES AND PARTS
25 rebuilt Curtiss OX-5's—$48 each; 15 rebuilt Hisso A's—$72 each; 10 rebuilt Hisso E's—$96 each. Many parts for Wright J-5, J-6, Pratt & Whitney Wasp, Cirrus, Kinner, Liberty, Hisso, OX-5 and OXX-6. Let us quote you on your requirements.
Machine work on all types of engines, including Cylinder Grinding, Valve Guides, Valve Inserts and Bearing Rebabbitting. Pistons, Pins and Rings carried in stock.
HECKMAN MACHINE WORKS, INC.
Aeronautical Machinists
4026 W. Lake St. Chicago, Ill.

AIRPLANES BOUGHT and SOLD

Trade or Terms
AVIATION SERVICE COMPANY
Brainard Field Hartford, Conn.

DETROIT AERO MOTORS CO.
14019 Hamilton Ave. Highland Park, Mich.
FOR SALE—AIRCRAFT ENGINES: 1 late type 45 h.p. Szekely, $250; Continental A70-1, 165 h.p., $350; Continental A70-2, 165 h.p., $450; J6-5, 165 h.p., $350; Wright J-5's, 220 h.p., $500; Wright Cyclone, Model E, 22 hrs. since major, complete with Standard Steel propeller and electric inertia starter, $650; 45 h.p. Ice Boat motor, $50.
1 Warner Ireland Privateer Amphibion, $250.
WE BUY AND SELL AIRCRAFT ENGINES

LAIRD-WASP 420 H.P.
Cruising speed .....150 m.p.h.
Top speed .....180 m.p.h.
Total time .....380 hours
$3000
AERO DIGEST, Box 1885

WILL SACRIFICE
Low wing, all metal, retractable landing gear, six-place transport. Built in 1933. With 500 S.D. Wasp motor cruising 200 m.p.h., top speed, 235. Suitable for private use or long distance speed records. Photographs and additional information to responsible buyers only.
FRANK WARDELL
3946 Woodward Avenue, Detroit, Michigan

KEYSTONE COMMUTER AMPHIBION
(4PCAmB)
35 hours since new
Will give away, absolutely free, several hundred dollars worth of spare parts with the purchase of this ship. Price complete, with extras: $3,500.
For further information or inspection:
BASIL AVIATION CO.
Philadelphia Municipal Airport Philadelphia, Penna.

SECURITY AIRSTER
Like new; starter, lots of extras.
COMET TRAVEL AIR
60 hours on motor; new cover; balloons and brakes.
JIM GRANGER
Clover Field, Santa Monica, California

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale
The Vimalert Company, Ltd.
835 Garfield Avenue, Jersey City, N. J.

WACO AIRPLANES
FOR SALE
HIGH CLASS USED AIRPLANES: Wacos, Lockheeds, Monocoupes, Birds; many others.
Gov't approved Repair Station
Gov't approved Flying School
Ships for charter
ERICKSON & REMMERT
Hangar 6, Floyd Bennett Field Brooklyn, N. Y.
Telephone: Nightingale 4-2100

FOR SALE

Lycoming Stinson SM-8A	$1,700
Waco Cabin-Continental 165 h.p.	1,700
Wright J6-5 Aristocrat	1,600
Wright J-5 Waco Taper Wing	1,400
Wright J-5 Waco Straight Wing	1,400
Warner Monosport	850
D. H. Gipsy Moth	600
Aeromarine Klemm, Salmson motor	450
Szekely-powered Curtiss Junior	400
Hisso-powered Alexander Eaglerock	400

HOEY AIR SERVICES
Hangar No. 3 Floyd Bennett Field Brooklyn, N. Y.
Tel.: Nightingale 4-4200

FACTORY RECONDITIONED STINSONS ARE BEST

IF you are in the market for Used Planes, it will pay you to get our list of Factory Reconditioned Stinson Planes, powered by the reliable Lycoming Transport Motor.

Write for our list today

STINSON
AIRPLANE EXCHANGE
Stinson Airport, Wayne, Mich.

AERO BROKERAGE SERVICE COMPANY
E. L. ERICKSON
LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA
"Selling the World Over"

KINNER B-5 engine, 300 hrs. total, just major overhauled $550
CHALLENGER engine, 20 hrs. since major overhaul $275
Write for New Price List on Airplanes, Motors, Parts.

For Sale: Certified Used Ships
WACO F-2: Jacobs motor; 80 hours; special price; many extras. Trade or terms to responsible parties.
WACO SALES
OF NEW YORK, INC.
Hangar 16, Roosevelt Field, Mineola, N. Y.
N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

FAST WARNER MONOCOUPE
Powered with Warner 110, this ship has consistently won speed events in 550 cu. in. approved type class. Ship and motor have less than 475 hours and recent major overhaul at Warner factory. First $1500 cash offer takes this bargain. Will demonstrate anywhere on guarantee of expense.
HELEN MacCLOSKEY
Bettis Airport, Pittsburgh, Pa.
Phone: Homestead 3480 Homestead 1616

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

AIRPLANES FOR SALE

AVAILABLE FOR IMMEDIATE DELIVERY

16 Lycoming Stinson Trimotors	3ig Spring, Cleveland, Tulsa, Dallas, Nashville, Chicago, Detroit, Albany	$4,500 te $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit, Ft. Worth	8,500
4 Wright Cyclone R. 1820 E Pilgrims	Cleveland, Albany, St. Louis	8,500
1 Wright J-6-9 Bellanca Pacemaker	Newark, N. J.	4,000
3 Wright J-6-9 Stearman 4CMI	Cleveland, St. Louis, Dallas	5,000

THIS AIRCRAFT is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.

CASH OFFERS are requested te include newly everhauled engines installed and "NC" License.

In the event ef export, all such shipments of aircraft will be covered by Export Airworthiness Certificates.

UPON REQUEST we will quote C.I.F. any desired Seaport or D.O.F. where now located.

Phetographs to responsible buyers.

ALL BONA FIOE CASH OFFERS WILL BE CAREFULLY CONSIOEREO

American Airways, Inc., Sales Div., Municipal Airport, Cleveland, Ohio

Branch Office—Sales Oivisien, 45 Vanderbilt Ave., New Yerk City

COMPER SWIFT—WINNER OF KING'S CUP IN ENGLAND—single seater monoplane; NC licensed; 184 m.p.h.; total time, 50 hours; $3,500.

TRAVEL AIR—4-place cabin monoplane; J6-7 with new clutch; recently overhauled by airline; new upholstery $1,100

1934 STINSON RELIANT—60 hours; completely equipped, with flaps; landing lights and flares, radio and blind flying instruments. Excellent buy.

BARB-AT SALES, INC.

Stinson Sales and Service

Hangar 17, Roosevelt Field, Mineola, N. Y.

Phone: Garden City 8888

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

FLYING SCHOOL

U. S. Department of Commerce Approved

INTER CITY AIRLINES, Inc.

BOSTON MUNICIPAL AIRPORT
EAST BOSTON, MASS.

DANIELGUGGENHEIM SCHOOL OF AERONAUTICS

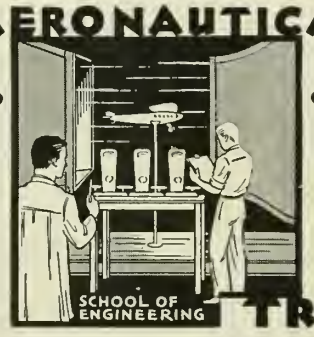
Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Ocan, College ef Engineering.

NEW YORK UNIVERSITY

UNIVERSITY HEIGHTS, NEW YORK, N. Y.

AERONAUTICAL ENGINEERING

DEGREE IN 2 YEARS



Become an Aeronautical Engineer. Tri-Stats College ecurse given in 108 weeks. Bachelor of Sciense degrse. Graduates in Mechanical Engineering can complete aeronautical courss in 2 terms (24 weeks). Thoreugh training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Nen-essentials eliminated. Courses dsigned te save student time and meney. Flying sshool facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter September, January, March, June. Courses are effered also in Civil, Architectural, Electrical, Mechanical, Chemical, Radie Engineering; Business Administration and Accounting. Living costs and tultien low. Those whe lack high schoel may make up work. World fameus for technical 2-year ecurses. Graduates successful. Write for cataleg.

10104 COLLEGE AVE., ANGOLA, INO.

TRI-STATE COLLEGE

CONFIDENCE

• • These, and other school advertisements appearing in the pages of AERO DIGEST, warrant your confidence; otherwise they would he rejected by this publication. Read them all, weigh each one carefully, then write for the literature of those in which you are particularly interested. Do not hesitate to write these advertisers on any question in your mind—your qualifications, the ultimate goal you hope to reach, etc.; the schools are anxious to help you. Or you may write the Training Bureau, AERO DIGEST, 515 Madison Avenue, New York, N. Y.

AUTOGIRO, AIRPLANE and ENGINE MECHANICS COURSE

taught under

GOVERNMENT LICENSED INSTRUCTORS

Complete instructions on all types of

MODERN ENGINES and PLANES

Day and evening classes

For information:

RISING SUN AIRCRAFT SCHOOL

"H" and Luzerne Street, Philadelphia, Pa.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

● PLANES AND ENGINES FOR SALE

AERONCA COLLEGIAN SEAPLANE: New last June, perfect condition, 200 hours total time; corrosion proofed, Edo pontoons, stainleas steel wires and control cables, Pioneer compass; motor, propeller and cockpit covers. Donald D. Cooke, Tenaflv, New Jersey.

FAIRCHILD 22: Cirrus; 425 hours, reconditioned and relicensed for year. Ship perfect, $1,425. Terms. Aviation Service Company, Brainard Field, Hartford, Connecticut.

$250: THREE-PLACE OXX-6 Swallow; excellent condition. NC license to May, 1935. Steven Hay, 3233 Republic Avenue, Racine, Wisconsin.

TRAVEL AIR 2000: Just relicensed, perfect condition throughout; new prop, full Millerized, oversize dropcenter tires, Scintilla mag. $725. W. J. Sheehan, 70 George Street, Attlehoro, Massachusetts.

J-5 PITCAIRN: Just relicensed. Dual controls and instruments, blind and night equipment, blind hood, flares, radio, cockpit phones, speedring, and air wheels. Tommy Winfield, 806 Homewood Avenue. Warren, Ohio.

WACO A: Kinner 125. Like new. Pants, air speed. Total time, 125 hours. Cash sale only, price $2,000. E. H. Long, South Vienna, Ohio.

FOR SALE OR TRADE: Tank-powered Waco 90. Just recovered; less than 100 hours. Perfect condition. Licensed until June, 1935. Will take a good OX on trade; also trade 125 h.p. steel propeller for airwheels. Harry Deuter Garage, 318 West Washington, Fort Wayne, Indiana.

WACO CABIN: 210 Continental. 4-place, new June, 1933. 240 hours, marvelous condition; always hangared and waxed. Privately owned. $3,500, cash. Rapid Air Lines, Omaha, Nebraska.

FOR SALE: OXX-6 Travel Air. New covera, motor overhauled; A-1 condition. Licensed to August, 1935. Looks and flies like new. Make me an offer or what have you? H. B. Mallette, Sterling, Illinois.

CURTISS-WRIGHT SEDAN: Four-place cahin. Perfect condition. Battery; starter. 295 hours since new. $2,000. Also Sikorsky S-39, like new. Sioux Skyways, Sioux Falls, South Dakota.

OX-5 CHALLENGER: Miller valve action; never cracked up; privately owned; licensed to July, 1935. Lowest cash price $500. Descomh, 100 Church St., Wethersfield, Connecticut.

CIRRUS MARK III Avro Avian: Excellent condition throughout. 221 hours; never cracked; licensed until April 15, 1935. Reasonahle cash offer. Jean Spielman, 12 Hurlhurt, New Haven, Connecticut.

CHALLENGER ROBIN: Just relicensed, perfect condition, steel prop., speed ring, hrakes; hest offer takes this ship or will take smaller ship in trade. Philip Miraglia, 208 Irvington Drive, Tonawanda, New York.

BARGAINS: Lycoming engine and SM8A Stinson parts for sale; also OXX-6 Swallow and Jacohs Spartan. Vermilya-Huffman Flying Service. Cincinnati. Ohio.

FOR SALE: 5-place Standard, D-25 model, has 50 hours since complete motor and ship overhaul; only $1,950. Another 5-place D-25 Standard with only 10 hours since complete ship and motor overhaul, only $2,300. Both ships have special paint johs, licensed and in finest condition. Address AERO DIGEST, Box 1872.

LATE OX-5 ROBIN: Millerized; Bosch magneto. Licensed to June, 1935. $475 or will trade for radial crack-up. Melvin Jacohson, 1314 9th Avenue South, Fort Dodge, Iowa.

COMMAND-AIRE OX-5: New covering, duals, motor turns 1470 on ground, licensed August, 1935, excellent condition throughout; flyaway, $550. Glove City Airways, Inc., Gloversville, N. Y.

OX-5 TRAVEL AIR: Recovered, spare motor, $450. Lamhert Monocoupe: Brakes, steel prop., $1,250. Both ships are in excellent condition and licensed. Box 32, Hillshoro, North Dakota.

WACO F, WARNER: Excellent condition, speed ring, high gloss finish on fuselage. Model S Stinson, Lycoming: Speed ring, retractable landing lights, turn hank, rate climh, clock, semi-airwheels, wheel fenders. J-5 Waco Straightwing: Just recovered, speed ring, motor overhauled. Terms to responsihle huyers. Ray Hylan. Rochester Airport, Rochester, New York.

FOR SALE: Travel Air W4000-Warner, 125 h.p.; steel propeller, air wheels, excellent condition, licensed, $1,100. Johnson Flying Service, Missoula, Montana.

3PCLM ARISTOCRAT: Continental 165; 350 hours, direct electric Bendix starter and generator, new Exide hattery, navigation lights, hrakes; fast, cruises 107; economical, hurns 10 gallons; had excellent care; sacrifice. G. F. Ingersoll, Shreveport, Louisiana.

BIRD: Four-place, CK, 125 h.p. Kinner B-5; 325 hours. Perfect condition; semi-airwheels, hrakes; steel prop. Licensed to July, 1935. $1,200. Stanlev Fuller, Milford, Iowa.

PHEASANT TRAVELER: Two-place; cantilever wing; Cirrus motor; Airwheels, hrakes, fenders, tail wheel; two props—Curtiss Reed, Hamilton wood. Beautiful new plane. Description, photograph available. $1,195. Trade for '34 Ford or Chevrolet. G. L. Landis, 926 North Jefferson St., Milwaukee, Wisconsin.

J-5 C STEARMAN: Perfect throughout; completely reconditioned; motor only 250 hours since hrand new. $1,250 delivered. OX-5 Fairchild Challenger, good condition, $300, terms, trades. AERO DIGEST, Box 1883.

CHALLENGER ROBIN: In excellent condition. Bendix wheels and hrakes. Pioneer compass. A hargain at $975. Will consider trade on small shin. Earl Gustafson. Milwaukee, Wisconsin.

RYAN B-5: 300 J-6; six-place; licensed to Septemher, 1935. Full air wheels. No reasonahle offer refused. Herhert Meeks, Walhridge, Ohio.

CURTISS-WRIGHT JR.: Relicensed, with flying instruction. $380. Tank Waco, $750. Franklin Sport, $775. J-5 Travel Air. $1,100. J-5 Mailwing, flares, radio and airwheels, $1,200. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

STEARMAN J-5: Ring, late type Pioneer instruments, steel propeller, fitted for flares, landing lights and radio: NC licensed; total time 700 hours. $1,075. R. Kenyon, 345 Linwood Ave., Newtonville, Massachusetts.

WACO F: Kinner B-5; 463 hours; air speed, hank and turn; shin recovered; red fuselage. cream wings and tail group, $1,500. Muncie Aviation Corporation, Muncie, Indiana.

WACO F: Warner; 280 hours; air speed, red fuselage, cream wings and tail group, steel propeller, collector ring; just relicensed, $1,500. Muncie Aviation Corp., Muncie, Indiana.

HEATH LNA-40 Parasol: Licensed June 1935; just recovered, complete, instruments: Compass G. E., tachometer, oil temperature, oil pressure, gas gauges; wheel pants, factory new guarantee. $575 cash. Terms to responsihle parties. International Aircraft, Niles, Michigan.

FOR SALE: Continental 165, second series, crankcase complete. Axelson B cylinders. Eclipse generator, type G-1. Lockheed parts, Eaglerock Model A parts. Lowest prices. Charley Raudahaugh. 13210 French Road, Detroit, Michigan.

KR-34: Excellent condition. J6-5. 30 hours. Steel prop, new type landing gear. Equipped for skywriting. Also spare engine, 10 hours. Apply AERO DIGEST, Box 1889.

TRAVEL AIR J-5: Ring, hrakes, hank and turn, electric starter, etc. Good condition, $925. Arrow Sport, LeBlond 65, ring, air speed, etc., 200 hours, good condition, $525. Hartung, Jamaica Sea Airport, Jamaica, New York.

CURTISS ROBIN: J6-5, 165 horse; three-passenger enclosed monoplane. Has metal propeller, hrakes, dual controls; has actual 350 guaranteed hours on motor and ship. Never cracked, ahsolutely most heautiful ship imaginahle; always had hest of care, always hangared. Fahric and entire ship like hrand new. Licensed until April, 1935, cruises 100 miles an hour, lands at 45. Will carry a hig load; five hours cruising capacity of gas. Will sell for $850, no less, on or hefore Octoher 15. Jones Repossessed Car Sales, 121 Alexander St., Rochester, N. Y. Phone: Main 8019.

SELL OR TRADE: Licensed J6-5 Spartan, A-1 condition; Heywood starter, steel prop, hrakes, motor ring; take OX-5 Rohin or Travel Air as part payment. Box 285, Greggton, Texas.

DAVIS MONOPLANE: 65 h.p. LeBlond, 240 hours. Excellent condition, licensed May, 1935. Has new Hartzell prop. $650. J. M. O'Leary, 122 Dix Avenue, Glens Falls, New York.

AVRO AVIAN: Purchased new; 189 hours total time, never damaged, always housed. Same as new. Cash price, $650 or will trade on Waco F Warner. J. Walker, 40½ N. Vermilion St., Danville, Illinois.

LATE 1933 Continental-powered Waco cahin, 115 hours, landing lights, flares, electric starter, generator, turn and hank, rate of climh, $4,000 cash. AERO DIGEST. Box 1892.

PITCAIRN AUTOGIRO: Major on Kinner B-5, excellent condition, $2,350. Waco 3 POLB, 210 Continental, 150 hours. 165 Continental engine, second series, completely overhauled. AERO DIGEST, Box 1890.

WACO CABIN: Continental 165; 358 hours; air speed, wood propeller, two-tone gray fuselage, silver wings and tail group; new tires, $1,600. Muncie Aviation Corp., Muncie, Indiana.

TRAVEL AIR OXX: New prop. A-1 condition. Licensed to Septemher, 1935. $500. George Myers, H. and Luzerne Sts., Philadelphia, Pa.

PITCAIRN SPORT MAILWING: Model P-6. Can't he told from new. Just major overhauled and recovered hy Approved Repair Station. Beautiful ship for sport or husiness. J-5 motor has total of 300 hours, no time since major. Will take small air-cooled joh or wreck in trade. Pioneer Aircraft Co., Teterhoro Airport, Hashrouck Heights, New Jersey.

FOR IMMEDIATE SALE or exchange: 10 certified airplanes, as follows: J6-9 330 h.p. 6-place Stinson cahin ship, with air wheels; 1 J-5 B-1 5-place Ryan; J6-5 175 h.p. 3-place Curtiss Rohin cahin ship; J-5 3-place Travel Air, late type; J6-9 330 h.p. Straight Wing Waco; J-5 Waco; J6-7 250 h.p. Straight Wing Waco; OX-5 Waco 90; OX-5 Travel Air; Wright Cyclone-powered 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean husiness. Will accept good late model cars on deals. Terms to responsihle huyers. Becker-Forner Flying Service, Inc., Jackson, Michigan.

WACO F: Must sell. 125 h.p. Kinner, 390 actual hours (hy owner only); never damaged. Cowl ring, steel prop, Heywood starter, lights; engine guaranteed, just had major for 400 hours service. Ship perfect; as evidence, will deliver anywhere for expenses and deposit. Need $1,500. R. V. Trader, Pittshurgh-Bettis Airport, Dravosburg, Pennsylvania.

FAIRCHILD 24: Super Scarah; 3-place, 1934 model. Like new, very little time; has hank and turn, Kollsman altimeter; $3.700. Kinner Bird, clean throughout, $1,100. Travel Air Wright J6-7, hank and turn, rate of climh: price for quick sale, $1,200. Leech Aircraft. Inc., Westchester Airnort. Armonk Village. New York.

AERONCA C-3: Recent factory overhaul; E-113A motor; winter enclosure. fenders. oleo landing gear; perfect condition throughout. $850 cash. Must sell. A. J. Leeward, New Kensington, Pa.

FLEET KINNER K-5: Completely overhauled and recovered Dartmouth-Tex AN fahric; custom finished red and hlack, Pittshurgh dope; air wheels, new tires, military windshields, new rigging wires, position lights, hlind flying instruments, etc. Never cracked: licensed: sold to settle estate; $1,550. J. B. Rahy, York, Penna. Route 6.

DRIGGS SKYLARK: Plane less than year old. Excellent condition, air wheels, hrakes, duals. Will accept late light car as part payment. B. H. Seydel, 771 Main, Kalamazoo, Michigan.

LAMBERT MONOCOUPE: Latest model, condition like new. Just relicensed. Extras include wheel pants, ring, electric starter and hattery. Finished in red, trimmed with hlue. Ship stored at Teterhoro Airport. Donald D. Cooke, Tenafly, New Jersey.

WARNER STINSON: Good cover, engine overhauled; reupholstered; hank and turn, climh; licensed; $750. Smaller ship in trade. Tooker, care E. M. S. Flying Service, Blue Ash, Ohio.

SELL OR TRADE: Savoia-Marchetti S-56. Ship completely rehuilt and relicensed until July, 1935. Many extras, including special landing gear with semi-airwheels. Paul Lonquich, 12 Highland Avenue, Yonkers, New York.

FOR SALE: 185 Challenger Bird, in excellent condition. Total time, 145 hours. Custom huilt. $1,800. Will accept an Aeronca part payment. AERO DIGEST, Box 1875.

NEW BIRD PLANES and factory huilt repair parts can now he purchased. For information, write Fred A. Anderson, Keyport, New Jersey.

$500, AMERICAN EAGLET: 30 horsepower Szekely. Just relicensed and redoped. Duals, compass, airspeed, altimeter and engine instruments. Atlee S. Richardson, 3545 Grove Avenue, Richmond, Virginia.

FOR SALE: Bellanca Model CH-300, 6PCLM J-6 300. Dual controls. Standard instruments and accessories. Plane time, 620 hours. Engine time since overhaul, 110 hours. Price, complete, $2,350. If you have J-5 or J-6 engine, make offer on airplane. Bellanca Aircraft Corp., New Castle, Delaware.

FOR SALE: Savoia Amphihion with B-5 Kinner; little time since major overhaul. Lamhert Monocoupe, just relicensed. Fairchild 22, in excellent condition. J6-7 Cessna, had very good care. Mead primary glider with automohile trailer. Write for full particulars. Airport, Box 136, Natick, Massachusetts.

TRAVEL AIR: 6-place 6000-B; J6-9 300 h.p. Wright. Engine just given complete major, 30 minutes time since. Ship licensed Decemher, 1934, and flown 30 minutes since. Retractahle landing lights, 2 Wiley flares, washroom. Owner must sell immediately. Rare hargain, $1,800. Curtiss-Wright Airport, Baltimore, Maryland.

WARNER ARISTOCRAT: 3-place cahin, licensed to July, 1935; excellent condition; will sell for $985. Anthony Maugeri, 732 McKean St., Philadelphia, Pennsylvania.

FAIRCHILD 22: Inverted Cirrus motor. Fleet, Model 9; many extras. Both ships mechanically perfect and equal to hrand new in appearance. Jack Byrne Flying Service, Central Airport, Camden. New Jersey.

WACO F: Kinner, 350 hours. Completely refinished and engine overhaul. Good condition, $1,250. Ryan Speedster, 3 POLB, Axelson 150 h.p.; plane refinished and engine just majored; $775. Cuh, 2 weeks old, 11 hours; Continental A-40-2 engine. Wolf Flying Service, Inc., Williamsport, Pennsylvania.

THE FOLLOWING AIRPLANES are now licensed and in good condition: OX Eaglerock, $250. Gipsy Travel Air, $1,100. Warner Waco, $1,400; Kinner Waco, $1,500. Six-place Stinson, $2,500; Stinson S, full night flying equipment and radio, $2,000. Becker Aircraft Sales Company, Dravoshurg, Pennsylvania.

WACO 10 OX-5: DH wheels; motor just majored; need $65 worth repairs to license; $225, f.o.h. Bethany, Conn. R. Kenyon, 345 Linwood Ave., Newtonville, Massachusetts.

MONOCOUPE "90": Total time 392 hours. Just relicensed. Only 11 hours since complete rehuild. First $1,250 takes it. Waco 90: Best OX-5 Waco in country. Rehuilt ahsolutely like new, $590. Challenger Rohin: Less than 130 hours total. Entirely recovered. $1.025. Mohawk Airways, Inc., Alhany Airport, Watervliet, New York.

AERONCA 2-place; Laird Whirlwind, wood and steel propellers; cash or trade. Parts for Warner, Szekely, J-4, J-5, J-6, Wasp, Cirrus. Fleet, Great Lakes, Buhl Pup, Travel Air 2000, Waco F, Waco 10, at hig discount. Heart of the Lakes Airways, Lake Delton, Wisc. In connection with Dell View Hotel on the Lake. Golf, fishing, hunting, hrick hangar. Special rates to pilots.

FOR SALE: Stinson trimotor, Model T Airliner, fully equipped. Complete information available on request. Trades considered. John T. Corrodi, Inc., Box 185, Bexley Station, Columhus, Ohio.

ONE LAMBERT 90: Six hours, factory rehuilt, $425. Velie M-5, majored, $200. Wood prop, $15. Identified monoplane, 2 POLM, air wheels, shocks, complete instruments. Good training ship, no crack-ups, always hangared, suitable for Velie or Lambert engine. Trade less motor for 1934 Ford V-8 sedan or $400 cash. Norman E. Nelson, 108 Avenue C. Clooquet, Minnesota.

HIGH ALTITUDE AMPHIBION: Ireland 5PCAB, modernized J-6 330; total hoat time 400 hours; Just overhauled; relicensed to Septemher, 1935; Loening extra heavy dural hottom with wide sponsons. Sacrifice for little more than cost of comnlete overhaul. R. Kenyon, 345 Linwood Ave., Newtonville, Massachusetts.

PLANES & ENGINES FOR SALE

HUNDREDS OF USED PLANES: Crack-ups, motors, parachutes. Every price and location. Send 20c for Directory giving owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

SACRIFICE SALE: 6-place J-5 Stinson, NC licensed; ship and motor 22 hours since major. Consider trade, open ship, new Ford. Write for information. AERO DIGEST, Box 1884.

WARNER WACO F: 125 h.p., steel prop, hank and turn, Heywood starter, navigation lights, privately owned, excellent condition, licensed until June, 1935; $1,400 or trade on two- or three-place cahin. A. B. Lauderbaugh, Washington, Pennsylvania.

FOR SALE: 125 Warner Fleet, just relicensed, semi-air wheels, brakes, starter, etc., $1,575. Will consider Hisso job in trade. James Cole, Rochester Airport, Rochester, New York.

J-5 WACO STRAIGHTWING: 435 hours; 100 hours since majored. Excellent condition, $1,500. Will accept trades. Prefer Aeronca. Also complete sign-towing equipment; interchangeahle letters. Arthur St. John, 502 Schenectady St., Schenectady, New York.

NEW STANDARD D-33: Three-place, licensed, Kinner B-5, total time 325 hours. Semi-air wheels and brakes. Ship in excellent condition. Price, $1,250 cash. Glenn Eberling, New City, New York. Phone: New City 77.

BARGAINS IN USED PLANES: 125 h.p. Kinner Bird; 170 b.p. Jacobs Bird; 125 Warner Fairchild Cahin; 125 Kinner; 170 and 240 h.p. Wright Spartan biplanes; 90 h.p. Cirrus Avian; 100 Kinner Gee Bee. Also spare Lycoming parts for motors. E. W. Wiggins Airways, Inc., Providence. Rhode Island.

LOCKHEED VEGA: Model 5-C; 7PCLM; de luxe joh. Ship and engine reconditioned and like new; $8,500. Boeing "95"; Hornet A-1; ship fully equipped and in perfect condition; $1,750. Charles H. Bahh, Grand Central Air Terminal, Glendale, California.

FOR SALE, BARGAIN PRICES: Two Warner Waco F's. One 1933 Waco C; one J6-7 Taperwing Waco. All like new. Also excellent J6-5 Eaglerock. Rapid Air Lines Corp., Omaha, Neh.

AERONCA TWO-PLACE: Licensed July 1935; motor majored, new covering, new windshield. Ship first class condition. Bargain at $650. Sam Hayes, Warren Airways, Warren, Ohio.

SAVOIA-MARCHETTI amphibion: 3-place, K-5, Heywood starter, standard instruments, 100 hours, just relicensed, always hangared at factory. $1,000, no trades. Harry Freedman, 270 Madison Avenue, New York, N. Y.

$160 CASH wins OX longwing Eaglerock, good condition. Easy and safe to fly, flying every day. Identified; can he licensed. Bud Greenert, 4 Roosevelt Aoartmenta, Butler, Penna.

WARNER MONOCOUPE: Blind flying instruments, steel propeller, semi-air wheels and brakes, good shape, $1.400. DH Ginsy engine, just majored, $150. R. Kenyon, Newtonville, Massachusetts.

FOR SALE: J6-9 330 h.p. 6-place Stinson cahin ship. Excellent condition throughout. No reasonable offer or proposition refused. Terms to responsible huyers. Michigan Aero Motors, Jackson, Michigan.

WACO CABIN: 210 Continental; many extras; perfect; hargain; nearest offer to $2,000 cash; will trade. Also De luxe Waco Cahin, 1934, Jacohs; distributor's demonstrator, like new; equipped with radio for night and hlind flying; $5,800. Write for details. Waco Sales of New England, Inc., Dennison Airport, Boston, Mass.

FOR SALE: 1930 Stinson Trimotor, 11-place airplane. Plane in operation approximately one year. Licensed in June, 1934. For further details, write Western Power, Light & Telephone Company, Huron Building, Kansas City, Kansas.

FAIRCHILD 24: 125 Warner, practically new; ship delivered November, 1933. Privately owned, always hangared; never damaged. Real bargain. Andrew Warwick, 3531 89th Street, Jackson Heights, New York.

VELIE MONOCOUPE: Just relicensed to July 15, 1935. Excellent condition. $445. Will deliver for expenses. Arthur Smith, 1453 Barnesdale St., Pittshurgh, Pennsylvania.

AERONCA: Single-place, just refinlshed, $350. Siemens Spartan, three-place, very good condition, $600. Stinson Junior, completely rebuilt and recovered, $1,500. Challenger Rohin, late type, just recovered, $850. Kinner Fleet, Model 2, very good condition, $1,100. All airplanes licensed. Will trade or arrange terms to responsihle parties. Indiana Air Service, Bendix Municipal Airport, South Bend, Indiana.

FOR SALE: J-5 Speedwing Travel Air, de luxe. Original cost, $9,000. Absolute total time, 160 hours. Like new. Full night flying equipment and extras. $1,750. R. L. Kendall, 235 Derhysbire Road, Waterloo, Iowa.

FOR SALE CHEAP: Stinson S, night and blind flying equipment, radio, little time. Travel Air sport trainer, good shape. Walter Hartman, 4061 Vinceton Street, Pittshurgh, Pennsylvania.

FOR SALE: Waco F Warner; licensed to August, 1935. OX-5, -6 parts. Wanted: Waco F-2 or C. Lloyd Pierce, 2629 Fox Avenue, Fort Wayne, Indiana.

EAGLEROCK OXX-6: Late center section model, perfect condition, $375 or will trade for another ship or late model car. Fred Lisch, Clinton Auto Co., Clinton, Indiana.

FOR SALE: Tbree-place Travel Air Sport, Kinner B-5. Speed ring, faired wings, brakes, steel prop; plenty extras. Relicensed November, 1935. Meriwether Aircraft, Manchester, Georgia.

5-PLACE FAIRCHILD FC-2: In excellent condition. Will take small ship or automohile as part payment. Stewart Motor Trucks, Inc., 933 Franklin Ave., Brooklyn, New York.

OX ROBIN for sale: Licensed to 1935. Ship in excellent condition. Scintilla magneto, compass, booster, etc. High compression pistons and Miller overhead. $390. Mantel, Jamaica Sea Airport, Rockaway Boulevard, Jamaica, N. Y.

CIRRUS ENGINES: English Mk. III; 97 h.p. at 2100 r.p.m. Brand new, $250. Suitable Avian or Great Lakes. Licensed. N. W. Perdew, Hashrouck Heights, New Jersey.

J-5 RYAN B-1: $1,080; engine majored, new tires, new propeller, good covering. Hisso 180 Travel Air, $990; engine majored, new hearings, piston rings; Scintilla magnetos. Fahric excellent, high gloss finish; hank turn, rate climh; metal propeller, brakes. OX-5 Challenger, $400; excellent condition throughout. J-5 Eaglerock, $795; licensed. Dick Schall, Berwyn, Maryland.

WACO "A": B-5 Kinner, steel prop, pants, ring, enclosure, turn and hank, Heywood starter. Privately owned, always hangared, never damaged in any manner. In new condition throughout. I must sell and first reasonable cash offer will huy. Address P. O. Box 177, Hastings, Neh.

SALE OR EXCHANGE: J6-5 Challenger, Warner Command-Aire. Both ships excellent condition, license expires June, 1935. Always hangared, never cracked. Equipped with semi-air-wheels, brakes, steel propeller, turn hank, usual instruments and extras. Located Philadelphia. Additional information, AERO DIGEST, Box 1894.

AVRO-AVIAN: New motor. Kinner American Eagle short nose, Model 201. Waco J-5. Straight Wing. Fairchild J6-9, 5-place. Hisso Eaglerock. Chuck O'Connor, Barnes Air Service, Westfield, Massachusetts.

THREE USED SHIPS: Excellent condition. Stinson "S," complete less left wing; two J6-5 Challengers. For further information or inspection: Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia. Pennsylvania.

WACO 3-PLACE open: Wright J6-5; licensed, in good condition throughout. $1,200 or consider trade on Warner or Kinner Monocoupe. J. W. Lytle, Box 263, Bridgeville. Pennsylvania.

$385 BUYS a Waco 10, relicensed August 15th for one year. Condition must he good, or it wouldn't he relicensed. Pioneer Aviation Co., Airport, Syracuse, New York.

DAVIS: 85 horsepower LeBlond; privately used; motor 65 hours, shin 22 hours. like new. Bargain, must sell. AERO DIGEST, Box 1899.

PRIVATEERS, P3B: 3-place cahin amphihion, 210 Continental. Two at $3,500 and $6,000 respectively. Both excellent condition. Just relicensed. Complete equipment of each includes hank turn, rate climh, comnass, anchor, metal propeller and radio honding and shielding. Cruising speed. 93 m.n.h.; range 4 hours. Amphihions, Inc., Roosevelt Field, Garden City, N. Y.

TAPER WING WACO: J-5 Wright, complete with special tank for inverted flying, compass, speed ring, etc.; reasonahle. Edwin J. Abrens, 2762 Hudson Blvd., Jersey City, New Jersey.

SIKORSKY S-38-B: 10-place, latest model, radio equipped: 100 hours since overhaul; will consider sale. trade or operating proposition. AERO DIGEST, Box 1898.

RYAN B-5: Like new, privately owned, never cracked. 245 engine hours. Modernized engine, semi-airwheels. Ideal for private owner wanting ship with plenty of room. Just relicensed. Milo Oliphant, Ypsilanti, Michigan.

LATE TYPE Velie Monocoupe. Recovered, majored, licensed. 16 hours. $600. Jos. J. McGranaghan. 109 S. 59th Ave., W., Duluth, Minn.

J6-5 WACO STRAIGHT WING: Steel propeller, bank and turn, brakes, $1,650. All bona fide cash offers carefully considered. Pioneer Aviation Co., Airport, Syracuse, New York.

WRIGHT J6-9 engine for sale: Reasonahle. Modernized. 170 hours since $1,000 major overhaul, new pistons. Engine at Denver. Privately owned. Alton Walker, 600 Graphicarts, Kansas City, Missouri.

BELLANCA SKYROCKET, Warner Fairchild 22, Cirrus Fairchild 22, Warner Faircbild 22 seaplane, Warner Fairchild 24, Fleet, Bird, Fokker Super Universal, Lockheed Vega, Lockheed Sirius, Wasp Laird, Warner and Lamhert Monocoupe, Stinson Jr., Stinson Reliant, Travel Air 6000, Stearman J6-7, Waco C, Great Lakes, Travel Air Sedan. J6-9 Laird cracked up. Stinson U Trimotor. Aircraft Sales Co., Roosevelt Field, Mineola, New York.

FOR SALE: Warner Aristocrat, 100 hours total time; condition like new; metal prop, complete Pioneer panel, speed ring; just relicensed. Ideal ship for private owner. Price $1,250. R. W. Simpson, Roosevelt Field, Mineola, New York.

FOR SALE OR TRADE: Stinson Lycoming. Travel Air J-5. Taylor Cuh. Curtiss-Wright Junior. OX-5 Challenger. Great Lakes Trainer, Cirrus engine. Write for details. Aero-Ways, Inc., Cleveland Airport, Cleveland, Ohio.

SELL OR TRADE: Rohin OX, Millerized. Scintilla. New $80 Hartzell. New covering, hand rubhed gloss finish. Tires, oleo springs, upholstering, pyralin floorhoard, all new. Wide front seat. Take automobile or plane and cash. Or sell, $700. H. Fairchild, 407 Ludwig, West Monroe, Louisiana.

FOR SALE: Lycoming Stinson; 210 Waco Cabin; Loening Commuter; Loening Air Yacht; Sikorsky 39; Bellanca Skyrocket; Sikorsky 38. Aero Brokerage Service of N. Y., Roosevelt Field, Mineola, New York.

USED AIRPLANE BUYERS: Why waste time and money? Write your wants and price range to Pioneer." Their experience and connections are at your service, at no additional cost to you. Terms can he arranged. Pioneer Aircraft Co., Airport, Syracuse, New York.

LAIRD J6-9: 330 h.p. (modernized); top 175, cruises 140, climhs 1,650. Townend ring, pants, semi-airwheels and brakes, oil radiator, front cockpit cover, complete instruments including rate of climh, turn and hank and earth inductor compass. Finished silver, trimmed red and black. All struts and wires chromium. Only 390 hours, 190 since major. Never cracked. $1,800, cash; no trades. Photographs if you mean husiness; photo collectors kindly ignore this. AERO DIGEST, Box 1901.

FOR SALE: Waco A; winter enclosure; 170 h.p. Jacohs motor; radio shielded; steel propeller. 250 hours total time. Never cracked, always hangared. No reasonahle offer refused. Bloomsburg Flying Club. Bloomsburg, Pennsylvania.

KINNER K-5 American Eagle: Model 201. Instruments, motor and plane in perfect condition. Navigation lights, air-wheels. Licensed to July '35. $750. Arcbie MacDougall, Pemhina, North Dakota.

FOR SALE: OX-5 Waco Ten. Relicensed August 15. Good condition. $400. Will fly anywhere for expenses. Jack Spaulding, Rice Lake, Wisconsin.

AERONCA SEAPLANE: Only 95 hours since new in Spring; special Edo floats for rough water or student work. Perfect condition. E. R. Closs, Lake Mohawk, Sparta, New Jersey.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

AIRMINDED young men, interested in entering Aviation as apprentices, write enclosing stamp. Mechanix-Universal Aviation Service, C-13291 Ardmore, Detroit, Michigan.

PATENTS: Small ideas may have large commercial possihilities. Write immediately for information on how to proceed and "Record of Invention" form. Delays are dangerous in patent matters. Clarence A. O'Brien, 3145 Adams Building, Washington, D. C.

LEARN TO FLY FOR LESS on new licensed airplanes. Earn room and board by rehuilding and servicing airplanes. Write for details. AERO DIGEST, Box 1881.

LEARN TO FLY: $3 per hour solo; $6 per hour dual, in a 125 h.p. Warner Fleet. Initial fee, $25. Monthlv dues, $3. Progressive Aviation Club, Inc., Flushing Airport, Flushing, N. Y.

TRANSPORT PILOT'S COURSE: $1,100. Pilot with own plane and 15 years flying experience will teach limited number. Will give instruction in your own town. AERO DIGEST, Box 1900.

WANTED TO BUY OR TRADE

HAVE CASH for J-5 Waco, Travel Air or Fleet, or similar ship. Give full description and hest price first letter. Glenn W. Fellows, P. O. Box 66, Jackson, Michigan.

WANTED: Two J-6 or Wasp Ford Trimotors. State factory serial number, license expiration date, total time on planes; serial number, total time each motor; also plane equipment furnished. State lowest cash price. AERO DIGEST, Box 1876.

TRADE: Mack International Truck, two and one-half ton, chain drive, pneumatic tires. Not late model hut used only short time. Cost $4,250; for two or three-place open ship, factory huilt, good condition, air cooled engine only. Give full description first letter. John Walker, 1131 Martin Bldg., Birmingbam, Alahama.

WANTED: Aerial camera, K-3 or similar. Describe fully with picture. Henry Hansen, 6 North Michigan Avenue, Chicago, Illinois.

WANTED: Ford Trimotors. J6-9E, Wasp and Wasp Junior engines and new parts for same. All must be in good condition. State cash price and give complete history and details. T A C A, Tegucigalpa, Honduras, Central America.

WANTED: Kinner low wing, Fleet, Great Lakes Trainer or any similar ship with 90 to 125 h.p. Standard instrument installation and brakes. Must he licensed and never cracked. State all facts in first letter. James DeMont Adam, U. S. S. "Kingfisher," San Diego, California.

WILL TRADE flying time on Ford trimotor or Stinson planes for an A-1 Ford or Chevrolet pick-up. Rolley Inman, Box 18, Coffeyville, Kansas.

WANTED: Licensed airplane or one that can he repaired for relicensing. Rising Sun Aircraft School, Inc., 857 East Luzerne St., Phila., Pa.

WANTED: Comet engine, Model E, 165 h.p. Prefer new motor, hut will consider good used one. State price. Pioneer Aircraft Co., Teterhoro Airport, Hashrouck Heights, New Jersey.

HAVE CASH for good Lycoming motor, propeller and starter. Give full description, hours and hest price at once. Michigan Aero Motors, Jackson, Michigan.

WANTED: Motors from 65 to 90 h.p., sucb as LeBlond, Walter, Genet, Warner Jr. and Siemens. Furnish price and condition. AERO DIGEST, Box 1879.

WANTED: Sikorsky S-39 left wing, center section, two hooms, flippers, stahilizer, motor mount, two outer interplane and engine struts. Immediate, cash. Send full information to Dr. Young, 909 West Broadway, Minneapolis, Minn.

MOTORS: Lamhert or Warner 90 h.p. Velie M-5, 65 h.p. Preferahly new or slightly used. Factory majored considered. State true condition, lowest price crated. Baumgardner, Fort Stockton, Texas.

WANTED: J-5 or J6-7 taperwing Waco. Must he in good shape. Have 3-place J6-5 Spartan advanced trainer to trade. Sbip in excellent condition. Hedler, Bendix Municipal Airport, South Bend, Indiana.

ANYONE HAVING Lamhert Monocoupe or Lycoming Stinson for sale please communicate with me. Have Irving chest, Russel hack pack parachutes for sale. Dennis Powelson, Box 522, Lake City, Florida.

WANTED: Mohawk Pinto low wing monoplane, preferahly of later series; complete less motor, needing rehuilding and covering. H. Rohmerts, Central Garage, Houston, Texas.

WILL TRADE: One $20,000 Isotta Fraschini super-sport car, driven 20,000 miles, in new condition, for good three-place airplane (seaplane preferred). Only worthwhile ships considered. Car in dead storage in New York. AERO DIGEST, Box 1874.

WANTED: J-5 Travel Air. Must he in perfect condition. Write or wire complete description. Wilson Airways, Box 182, Schiller Park, Illinois.

WANTED TO BUY OR RENT: Pontoons for Model 2 Fleet. Must he good condition and reasonahle for use, November to May. C. W. Clements, Airport, Dover, Delaware.

CASH for air-cooled ship ahout 100 b.p. Bird preferred. Full description and lowest price first letter. AERO DIGEST, Box 1888.

WANTED FOR CASH: Used planes and engines. Also Cyclops Aerial Camera. Give full details, price and location in first letter. AERO DIGEST, Box 1887.

WANTED IMMEDIATELY: Kinner front exhaust heads and cylinders, Warner and Aeronca motors or any parts of same. Aviation Salvage Company, 6205 South Menard Ave., Chicago, Ill.

CASH FOR YOUR damaged airplane or parts tbat can he repaired and licensed. Give complete description and price in first letter. Address AERO DIGEST, Box 1886.

WE WANT TWENTY AIRPLANES! If you want to sell your sbip, get in touch with us. We will make you a cash offer upon inspection of ship or free storage in our sales hangar, Municipal Airport, Kansas City, Mo., if your ship is left here for sale. Bredouw-Hilliard Aeromotive Corporation.

POSITIONS WANTED

TRANSPORT PILOT: Age 22, 400 hours; single, soher, amhitious, not afraid of work. Fly anytbing, anywhere. Consider any job. Employed at present. AERO DIGEST, Box 1873.

YOUNG MAN: Single, graduate A & E mechanic's course, also aircraft factory experience, desires position to get experience for license. References, go anywhere. AERO DIGEST, Box 1871.

TRANSPORT PILOT: Age 25. Desires employment with company or private owner—or anything you have in flying. Good record; references. AERO DIGEST, Box 1877.

TRANSPORT PILOT: 210 bours; age 18; experienced different types airplanes; also radio heam, hlind and night flying. Nervv, ambitious. Free to travel. References. AERO DIGEST, Box 1878.

WANTED: Position flying for private individual, commercial concern or school. Transport pilot, seven years actual flying, age 24; single. Good record, personality, sales experience, etc. Address AERO DIGEST, Box 1882.

YOUNG MAN: 21, Bs. in M.E., majored in aeronautics, desires position with good firm leading to executive position. Interested in research, speed designlng, transport heating and ventilating, advertising. References. J. W. Thornall, Metuchen, New Jersey.

YOUNG MAN: 20, desires position as secretary-stenographer with aviation concern. Four years secretarial experience, also Dictaphone operator. Have 20 hours solo time. AERO DIGEST, Box 1880.

TRANSPORT PILOT: 26, single, seven years' experience; cross-country, instructing, airport management, harnstorming. Can ably fill anv flying position, go anywhere. AERO DIGEST, Box 1893.

TRANSPORT PILOT: Mechanic, five years' experience. Thoroughly competent instructor, airline co-pilot, airport manager. 27. Excellent references, clean record. Go anywhere. Investigate. AERO DIGEST, Box 1895.

HELP WANTED

TRANSPORT PILOT WANTED: Experienced in automohile repair work. Give full details first letter of experience in hoth lines. Rohert Ahhott, Taos, New Mexico.

PARACHUTES FOR SALE

PARACHUTES: Approved type. Seat, hack, lap and chest; hought and sold, exchanged, repaired. Tell all first letter. Professional paracbute jumpers and halloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

MISCELLANEOUS PRODUCTS, ETC.

AUTO AVIATION EMBLEM: Attractive; showing real aviation insignia; cast aluminum featuring wings, engine, propeller. 12" wide, 4½" deep. Easily attached to auto, rear or front. $1 postpaid, 2 for $1.75. Satisfaction guaranteed. Aviation Emhlem Department, 534 Broad Street, Newark, New Jersey.

WAR RELICS for cluhhouse or den. Vickers aircraft machine guns; cost government $700; rendered unserviceable without marring. Only $7.75 each. Sent C.O.D. on payment of $1. Weight 33 pounds. Fiala Outfits, 47 Warren Street, New York, N. Y.

USED MOTOR PARTS: Like new. J-5 completely overhauled from huh nut to oil pump, reasonahle. 2 first series 165 Continentals, sale or exchange. Wanted: J-5 Warner, Lycoming. AERO DIGEST, Box 1891.

NAVAL AIRCRAFT COMPASSES: For table, overhead or bulkbead mounting. $5 each, good condition. Also Curtiss 12 hand starter, never used, $5. Marine Salvage, Pier 11½, North Delaware Avenue, Philadelphia, Pennsylvania.

WE HAVE A COMPLETE LIST of Kinner K-5 side exhaust motor parts, Warner parts, NAR-5A carburetor parts, instruments of all kinds. Write for detailed list and our reasonahle prices. All parts guaranteed good condition. Aviation Salvage Company, 6205 South Menard Avenue, Chicago, Illinois.

PROPELLERS: Lowest prices in tbe country. Steel props for J-6, J-5. A few hrand new Hamilton wood props at $15. We stock Flottorp, Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

RELIABLE NEW AND USED PARTS: All used parts reconditioned. Send 3c stamp for list. Wanted: Miller overheads, OX-5 parts, new or slightly used. Aircraft Salvage Shop, Teterhoro Airport, Hasbrouck Heights, New Jersey.

FOR SALE: 1933 Continental engine, complete with Heywood starter; less tban 100 hours; just top overbauled hy Continental; practically new. Latest type Irving cahin seat parachute, leather upholstery. Wright Series A 300 h.p. engine, not run since Wright overhaul. New metal propeller for Siemens 9-cylinder 125 h.p. engine. Waco Aircraft Co., Troy, Ohio.

$ CASH $: Steel hangar, 40 x 40; A-1 shape. New type Jacohs 170, 5 hours guarantee. New 22 x 10-4 pants. What is hid? McPherson, Ahingdon, Pennsylvania.

WACO F PARTS: Two lower wings, fuselage, tail group; also OX Command-Aire, $350. 125 Kinner prop, $125. A. L. Matthews Repair Station, Schenectady, N. Y., Airport.

WING EXCHANGE: Trade your wrecked wings for rehuilt or new ones. We also have spars, rihs and struts. New London Aircraft Co., New London, Ohio.

FOR SALE: One Sperry Horizon, one Directional Gyro, just recalihrated. Perfect condition, hest blind flight equipment. Must sacrifice. $190 each, less venturis. AERO DIGEST, Box 1896.

FOR SALE: Two Wasp C 420 h.p. motors; one Wright J-5 Hamilton propeller; one set Lycoming propeller hlades. Send cash offer. AERO DIGEST, Box 1897.

SCINTILLA MAGNETO for OX-5, complete, $40. New Supreme propeller for 85 or 90 LeBlond, $20. Rising Sun Aircraft School, H and Luzerne Sts., Philadelphia, Pennsylvania.

SEAPLANE TERMINAL for sale: Now in use at 155th St., North River. Completely equipped. including large turn table ramp, traveling bangar ramp, hangar space for three or four ships, offices, cluh room, lavatories and passenger deck, two staterooms; 1500 gal. gasoline tank and pump; motor hoat. Entire equipment mohile; can he delivered anywbere in navigable water. Sale price is low. Net annual income 15% of sale price. E. R. Closs, Lake Mohawk, Sparta, New Jersey.

INDEX TO DISPLAY ADVERTISERS IN THIS ISSUE

"The World's Best Books on Aeronautics"

A PILOT'S TRAINING GUIDE:

Practical Flying

by Major B. Q. Jones, *Air Corps, U. S. Army; formerly Chief, Aviation Training, A.E.F.* **$3.00.**

This famous pilot's manual can save you hours of time and a lot of money in your flying training. Reading this book is like having at your elbow the famous flyer who wrote it, ready to clear up quickly all the scores of questions that puzzle you as you progress to the skill of an expert pilot. It gives you the basic facts that otherwise you would have to learn from long and costly experience. Major Jones provides clear and concise answers to the hundreds of questions that student pilots have asked for years—information that is essential for a proper understanding of piloting. For much of the detailed information the material is prepared in question and answer form. A variety of practical subjects is covered such as taxying, the take-off, the initial climb, emergency landings after the take-off, straightaway flight, turns, figures-of-eight, glides, landings, cross-country flying, stalls and spins, etc. The hook is packed with useful facts on planes, instruments, technical expressions, plane parts, pilot's equipment, methods of plane inspection, testing controls and motor.

INTRODUCTION TO AIRPLANE DESIGN:

Elements of Aviation

by Colonel V. E. Clark, *formerly Chief Aeronautical Engineer, U. S. Army.* 24 *illustrations.* **$3.00.**

A simple explanation of the principles of flight and of elementary airplane design, telling just what an airplane does and why it does it. The hook covers the fundamentals of aerodynamics by simple, easily understood comparisons; laws of motion and their application in aeronautics; air forces; lift and drag; airflow over various surfaces; effects of airflow; stability and control; propeller effects; slipstream, etc.; effects of altitude; parts of an airplane; weights and dimensions, etc.

PREPARES FOR ANY LICENSE TEST:

Aeronautics

by Hilton F. Lusk, *formerly Dean, Boeing School of Aeronautics.* 175 *illustrations.* **$3.25.**

This is a complete ground school course in handy hook form. It clearly and thoroughly explains all the subjects you need to understand to pass the written part of the government examinations for a license as an airplane pilot in any of the grades — including transport pilot, or as an airplane or engine mechanic. No one who masters this hook will have any difficulty in answering any question that may he asked in the license examination. 224 test questions help you test your grasp of each subject. It is so clearly and simply written that you will have no trouble in grasping its explanations even if you must study at home without the aid of an instructor. One entire chapter is devoted to a description of 125 occupations in the aeronautic industry. The 15 chapters explain just what you need to know about Flight Principles; Airplane Construction, Operation; Engine Principles, Construction, Operation; Propellers, Blind Flying and Engine Instruments; Maps; Piloting; Dead Reckoning; Avigation Instruments, Equipment; Meteorology.

USED BY FAMOUS DESIGNERS:

Engineering Aerodynamics

by Lieut. Cmdr. Walter S. Diehl, *(C. C.) U. S. Navy, Scientific Section, Bureau of Aeronautics.* 159 *illustrations.* **$7.00.**

In this hook America's outstanding authority covers modern hydrodynamic theory and its practical applications, including stream function, velocity potential, circulation vortex theory, induction theory, etc. Test data on standard wing sections, ailerons, streamlining, etc., are included with working diagrams and equations, and detailed instructions for their use. Shows how to interpret model test data, gives methods for designing control surfaces, and for rapid performance estimation.

(Fill in, tear out, and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,

Dept. M810, 15 East 26th Street, New York

Send me the hooks checked helow. Within five days after their receipt I will either return them or send payment in full at the prices shown plus a few cents for delivery charges. (We pay delivery charges when cash accompanies order—same return privilege.)

☐ *Jones,* **Practical Flying**	$3.00	☐ *Diehl,* **Engineering Aerodynamics**	$7.00
☐ *Clark,* **Elements of Aviation**	3.00	☐ *Carter,* **Simple Aerodynamics**	4.50
☐ *Lusk,* **Aeronautics**	3.25	☐ *Moors,* **Engine Manual**	4.50
☐ *Hartz-Hall,* **Rigging Handbook**	$3.50		

Name .....

Home Address .....

City ..... State* .....

☐ Employed hy,
☐ or Reference .....

(Above line must be filled in unless you send casb.)

* If outside continental U. S. and Canada, send cash plus 25c per hook for shipping.

FIRST BOOK IN AERO ENGINEERING:

Simple Aerodynamics and the Airplane

4th Revised Edition by Colonel C. C. Carter, *U. S. Military Academy, West Point.* 395 *illustrations.* **$4.50.**

This famous texthook is used hy the Army cadets at West Point and by students in over 100 leading technical schools, colleges, and flying schools. Everywhere recognized as the outstanding technical hook in the aeronautic field, no other hook approaches this in popularity or is so widely used.

It provides a clear and easily understood explanation of the fundamental aerodynamics involved in the design and operation of the airplane. It shows, for example, how to make the necessary calculations to estimate the performance of a particular plane under various conditions.

The scope of the hook ranges from the explanation of the fundamentals of air flow and production of lift to the complete airplane, its stability, maneuverahility, and performance. Chapters include: Airfoils and Their Selection; Parasite Resistance; Propeller; Complete Airplane; Stahility; Control Surfaces; Performance; Dynamic Loads; Materials and Construction; Equipment; Navigation.

A COMPLETE ENGINE COURSE:

Aircraft Engine Mechanics Manual

by C. J. Moors, *Chief Instructor, Department of Mechanics, Air Corps Technical School, U. S. Army.* 189 *illustrations.* **$4.50.**

This hook covers the same ground as the course given the enlisted mechanics of the Army Air Corps with the addition of much data on types of equipment adapted only for commercial airplanes. It deals thoroughly with all kinds of aircraft engines and their accessories. It explains exactly how they operate and the features in which the various makes of competing equipment resemhle each other and those in which they differ.

Mr. Moors gives all needed data on construction and operation, supplies full instructions for proper maintenance, and shows you exactly how to go about making any necessary repairs and adjustments. Photographs, diagrams, and working drawings make it easy for you to follow each explanation.

ESSENTIAL FOR SAFE FLIGHT:

Airplane Mechanics Rigging Handbook

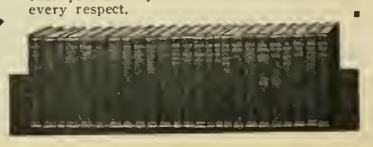
by R. S. Hartz, *formerly Lieut. Colonel, Air Corps., U. S. Army; and* **Lieut. E. E. Hall,** *formerly Editor, "Aircraft Servicing."* 104 *illustrations.* **$3.50.**

This book covers in detail the care and handling of airplanes on the ground and in the shop; sequence of rigging steps; how to true up the assemhled ship; how to adjust the wings and control surfaces for "hands off" flying; spars and struts; inspection; installing and checking compasses; fahric; wood and glue; metal parts; wire; dopes and doping; folding and packing parachutes. It shows you how to get a plane into proper flying condition and how to keep it that way.

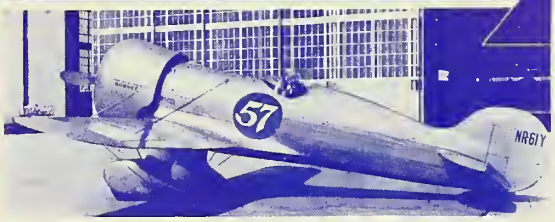
Satisfaction Guaranteed

Sent on 5 Days' Approval

You can order any of the hooks described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.



ROSCOE TURNER WINS FIFTH ANNUAL THOMPSON TROPHY RACE



The plane . . . . a Wedell-Williams "Special"

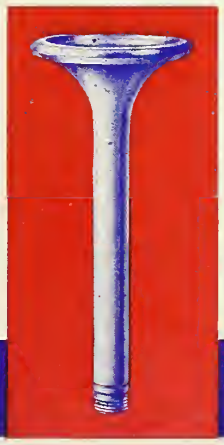
The pilot . . . . Roscoe Turner

The engine . . . . a "Hornet"

CIRCLING an 8⅓-mile closed course at Cleveland Airport on Labor Day, Roscoe Turner averaged 248.129 miles an hour for 100 miles to win the fifth annual Thompson Trophy Race. 100,000 saw Turner's Wedell-Williams "Special" cross the finish line, climaxing the 1934 National Air Races. Turner's ship was powered by a Pratt & Whitney "Hornet" with a displacement of 1,690 cu. in., super-charged to 1,000 h.p. This engine and the motors of practically all aircraft flown at the Air Races were equipped with Thompson Valves.

The Thompson Trophy was conceived in 1930 by the late Charles E. Thompson to promote greater speeds for aircraft of practical commercial and military value. To perpetuate this high purpose of its former president and founder, Thompson Products, Inc., has undertaken the sponsorship of the Thompson Trophy and the annual contest at which it is awarded.

THOMPSON PRODUCTS
INCORPORATED
General Offices:
CLEVELAND, OHIO, U.S.A.
Factories:
CLEVELAND and DETROIT



Thompson Valves

8 YEARS OF PROGRESS HAVE PRODUCED THE *New* H *Wasp*

The new H Wasp is more than twice as powerful as its predecessor of 1926. Its specific weight has been reduced to an absolute minimum, and, altogether, this new engine is a distinct improvement over any previous Wasp. In design and construction it embodies every refinement suggested during the millions of hours Wasp engines have served aloft throughout the past eight years. In addition, there are many new developments and improvements contributed by the Pratt and Whitney engineering staff. An Approved Type Certificate, Number 129, for the first engine of the H Series, is based upon a rating of 550 hp at 2,200 rpm at 8,000 feet.

Features of the New H Wasp

STRONGER MASTER ROD AND LINK RODS · STRONGER CRANKCASE · IMPROVED SUPERCHARGER DRIVE · STRONGER PISTON WITH FIVE RINGS · IMPROVED VALVE WITH STELLITE FACE · NEW DESIGN, STRONGER AND STIFFER CRANKSHAFT · LARGER AND STRONGER MAIN BEARINGS · IMPROVED SUPERCHARGER SPRING DRIVE · IMPROVED REDUCTION GEAR · AUTOMATIC VALVE GEAR LUBRICATION · AUTOMATIC OIL TEMPERATURE CONTROL · PRIMING CARBURETOR · NEW PRATT & WHITNEY FINE FIN CYLINDER HEADS · NEW CAM MOUNTING AND DRIVE · PRESSURE COOLING BAFFLES · OIL TIGHTNESS THROUGHOUT · PROPELLER CONTROL ON REAR OF SUMP · NEW COMPACT HOT SPOT · NEW DESIGN PRATT & WHITNEY RADIO SHIELDING

PRATT & WHITNEY AIRCRAFT COMPANY, EAST HARTFORD, CONNECTICUT

ovember 1934

35 Cents

AERO DIGEST

INCLUDING

AVIATION ENGINEERING

Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.


U T I L I T Y
U.S. NAVY
U.S. NAVY
U.S. NAVY
GRUMMAN AIRCRAFT ENGINEERING CORPORATION
FARMINGDALE LONG ISLAND NEW YORK

Jimmy James, veteran pilot and Superintendent of Operations for General Air Lines, which uses B. G. Mica Aviation Radio Shielded Spark Plugs like those shown above and at the right.

Patented in the United States and other countries

GENERAL AIR LINES

(Western Air Division)

This Line, successor to Western Air Express, is the pioneer mail and passenger airline in the West. It has flown more than 110,000 passengers over 15,000,000 miles without a single fatality or a serious injury. Its route is from San Diego to Los Angeles through Las Vegas (Hoover Dam) to Salt Lake City.

Jimmy James, piloting General Air Lines plane and talking to ground station through microphone

THE B. G. CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 WEST 52nd STREET, NEW YORK **Cable Address: Golsteco, New York**

● The Consolidated P-30 is the highest-performing Two-Seat Military Pursuit Airplane of its type available in the world. It embodies advanced features in design, construction and utility, with unequalled maneuverability and high speed at great altitudes.

● The Consolidated A-11, Two-Seat Attack Airplane, is basically similar to the P-30, but differs in performance in that it affords unequalled maneuverability and high speed at low altitudes. The basic similarity of these two military airplanes makes many parts of each interchangeable—a decided economy in maintenance.

● Both the P-30 and the A-11—the result of three years intensive engineering development—have been tested extensively as service equipment. Their use, in sufficient numbers, will place our air force in a definitely superior position to that of any other nation, and will add tremendously to our Air Corps' STRIKING POWER.

THE CONSOLIDATED AIRCRAFT CORPORATION, BUFFALO, N. Y.

AROUND THE WORLD..

Parks Graduates are making Aviation History

Across the broad expanses of China with her teeming millions—

Over the mountains and valleys of Siam, from the rain drenched plains on the Bay of Bengal to the remote highlands famed for sapphires and emeralds—

Throughout the length and breadth of rugged Alaska, from Anchorage in the South to fire-ravaged Nome in the North—

High above the hurricane lashed waters of the Caribbean—

Up and down the limitless coastline of South America—

Over the mighty snow-bound "Hump" of the Andes on the difficult route from Buenos Aires to Santiago—

And in every part of the United States, the graduates of Parks Air College are carrying on the Conquest of the Air started by the resourceful Orville and Wilbur Wright just 31 years ago.

As the Wrights prepared with painstaking care for that first epoch-making flight of 12 seconds over the sand hills of Kitty Hawk, so these graduates of Parks have prepared themselves, by thorough training, to conquer the elements in every climate and to make the airplane the dependable and marvelously efficient servant of men everywhere.

All the resources of Parks Air College are devoted exclusively to aeronautical education and training.

With its own airport of 100 acres—with extensive buildings and elaborate flight, shop and laboratory equipment—with a personnel of 41 and a background of over five million miles of flight training, and the rebuilding and servicing of 1,385 airplanes and 367 motors, Parks Air College is especially well qualified to provide you with aviation training which leads directly to success.

Parks offers you three two-year courses leading to BACHELOR-OF-SCIENCE degrees in

- **AVIATION ADMINISTRATION**
- **AERONAUTICAL ENGINEERING**
- **AVIATION MECHANICS**

The heavy Fall enrollments have made necessary the building of a large, new dormitory. Even so it may not be possible to admit all students who want to come between now and the beginning of the Winter term on January 7th.

If you, too, want to make aviation history at home or in the far places of the world; if you want to become an important part of the great aviation industry; you will want to know all about the opportunities offered you by Parks Air College. Mail the coupon, and the descriptive catalog—"Skyward Ho!"—and the Outline of Courses will be sent you immediately. You should act promptly to assure yourself of accommodations when you are ready to come, so

MAIL THE COUPON NOW

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL AVIATION SCHOOL

Approved by U. S. Dept. of Commerce

SECTION 11-AD, EAST ST. LOUIS, ILL.

"SKYWARD HO!"

Our 44-page catalogue, completely describing Parks Air College and Parks training, will be sent free on request.

Name.....*Age*.....

Address.....

City.....*State*.....

CHECK HERE

for special information on the course that interests you:

- ☐ Executive Transport Pilots'
- ☐ A. & E. Master Mechanics'
- ☐ Aeronautical Engineering
- ☐ Limited Commercial Pilots'
- ☐ A. & E. Mechanics'

A. S. Menasco, noted engine designer,

compliments Kendall Oil

A. S. Menasco, noted designer and builder of aircraft engines, whose motors powered more winning planes at the 1934 National Air Races in Cleveland than all other makes of engines combined. And every Menasco-powered winner had his Menasco engine lubricated for the supreme tests with Kendall Oil! Read Mr. Menasco's opinion of Kendall Oil in his letter at right.

MENASCO MANUFACTURING COMPANY
6714 McKINLEY AVENUE
LOS ANGELES, U.S.A.

September 21st
19 34

Kendall Refining Company,
Bradford, Pa.

Attention — Mr. I. H. Shearer

Dear Mr. Shearer:

As you know, Kendall Oil was used by all of the pilots of Menasco engines winning events at the recent 1934 National Air Races at Cleveland.

We believe this constitutes an excellent endorsement for your products, as the competition this year forced these smaller engines up to even higher power output than they were called upon to produce last year, when they registered a similar success.

The rivalry existent between several of these pilots, who were flying almost identical equipment, brought about very strenuous demands upon the engine and airplane, as well as the fuel and oils used.

It is especially noteworthy that in the 375 cubic inch class, that qualifying speeds above 233 miles per hour were reached.

It is our understanding that we won thirty of forty possible prizes at this meet — more than all other engines combined. We believe that these victories for two successive years attest to the reliability of our engines as well as to their performance.

We hope that you will be pleased by these results, as they are also a victory for your product.

Very truly yours,

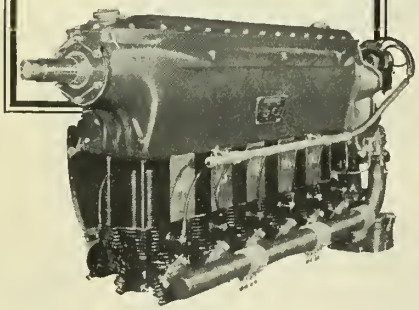
MENASCO MANUFACTURING COMPANY

A. S. Menasco

A. S. Menasco

Kendall Oil-Menasco Engine Winners in National Air Races, 1934

Roy Minor
Lee Miles
Harold Neuman
Art Chester
Roger Don Rae
Earl Ortman
Roy Hunt



The Menasco "Buccaneer" Aircraft Engine, 210 H.P. at 2175 R. P. M., 415 lbs. dry weight.

AT the 1934 National Air Races in Cleveland this year, Kendall, The 30 Hour Oil, once again proved by actual performance its right to the premier position it holds in the aviation industry. 65 out of 67 winners in these races, or 97.01%, roared across the finish line to collect their prize money with Kendall Oil lubricating their engines!

No wonder more pilots each day choose Kendall Oil as the finest lubrication insurance they can possibly obtain. Performance such as Kendall Oil rendered in these National Air Races can mean only one thing: that this oil is the top-notcher in quality, lubricating efficiency and dependability.

Kendall Oil is available at all important airports in refinery-sealed cans. Try it in your engine . . . and learn what genuine motor oil efficiency and economy can be!

At the National Air Races Kendall Oil Users Won:

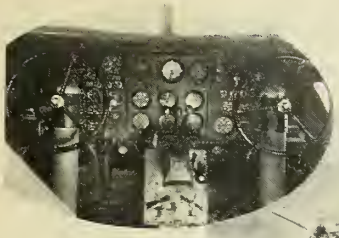
16 out of 17 First places
13 out of 14 Second places
13 out of 13 Third places
12 out of 12 Fourth places
11 out of 11 Fifth places
Total 65 out of 67 or 97.01%

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL

KENDALL REFINING COMPANY • BRADFORD, PA.

THE STINSON MODEL 'A' is the World's Fastest and Most Economical Trimotored Airliner



• THE NEW ROAD TO REVENUE

More passengers and more express poundage can be had. Tap these reservoirs of traffic.

Fast, modern airplane service to medium sized cities backed up by intensive traffic solicitation is the new road to revenue.

The major cities have responded with more traffic to the fine service offered by high-speed Transcontinental planes which make fast schedules by reducing the number of stops and by flying at high altitudes, but Transcontinental planes do not serve the shorter hauls adequately.

Therefore, the medium sized cities, which far outnumber the large terminals and which have the greatest need for faster service, are either being neglected or are offered airplane service which is not sufficiently attractive to impel its use. For these reasons, the fullest possibilities of the short haul are not being realized.

As early as 1929, Stinson foresaw the revenue opportunities of this situation and has produced single and trimotored planes capable of making frequent stops, serving more people, and producing the largest NET RETURN.

The latest Stinson Trimotored Airliner was conceived and built to serve the shorter haul in an economical manner. Coupled with trimotored safety for night and bad weather flying, it MAKES GOOD high speeds at low altitudes. Its trim and sturdy lines have eye appeal, while the quiet, spacious cabin, comfortable reclining chairs and fine visibility, are several of the many attractive features which expert Traffic Men know that the public now demand.

It is our belief, backed by having built 77 Trimotors which have flown more than 25 million miles, that this latest Stinson Airliner will produce GREATER NET RETURNS on short haul runs than any other multimotored transport built today.

Modern design, proven construction, and known maintenance costs, make this Airliner the safe buy of the year for forward seeing Operators who believe that people will use airplanes in ever increasing numbers if offered fast, frequent, dependable service at fair rates.

SPECIFICATIONS

Cruises above 155 MPH at low altitudes.

Take-off Run—under 800 feet with full load.

Initial Rate of Climb with full load—1000 feet per minute.

Landing Run, with full load—600 feet.

Fully loaded will climb above 8000 feet on two engines.

Gas Consumption—42 Gallons per hour.

Gas Capacity—160 Gallons.

Useful Load—3080 Pounds.

8 Comfortable Passenger Seats.

3 Baggage and Mail Compartments, with total allowable capacity of 800 pounds.

3 Reliable Lycoming 260 HP Transport Motors.

3 Lycoming-Smith Controllable Pitch Propellers with chrome-vanadium steel blades.

Landing Flaps — nacelle to nacelle.

Sperry Horizon and Gyro, Blind Flying Instruments, Landing Lights, Flares, Shielding and Bonding, Airwheels, Hydraulic Vacuum Booster Brakes.

STINSON AIRCRAFT CORP., WAYNE, MICH.

World's Largest Builders of Cabin Airplanes

LOVE FIELD

DALLAS AVIATION SCHOOL AND AIR COLLEGE

DALLAS TEXAS

Where you save time, save money, and make good

NOW—OUR ENROLLMENT THE LARGEST IN YEARS

The flying school that GETS THINGS DONE is the center of interest among red-blooded young fellows of the whole U. S. A. today. We are ON OUR WAY—students and instructors and officials all working together at the big job of making this school a REAL national leader.

Come and learn to fly where you save money—save time—and make good!

- $15,000 machine shop.
- $40,000 stock of parts and supplies.
- Today's flying and training equipment—no old style ships or motors.
- Shops for welding, plating, propellers, motors and aircraft.
- Our students are given every advantage — you GET THINGS DONE here.

THE SHIPS WE OWN

- 5 Fleets
- 1 Stearman
- 1 Stinson Cabin
- 1 Waco Cabin
- 1 7-Place Travel Air "Wasp"
- 1 Fledgling
- 1 Swallow Trainer
- 1 Trimotored Ford

Greatest line-up in U.S.A.

- Love Field—a million dollar airport. One of America's best.
- We have $200,000 in equipment for you.
- Good flying weather all winter — no delays through bad weather.
- We own our own dormitories and cafe—we see that our students get the best for the least money.
- No other school in America offers equal opportunities for its students to observe the actual operation of air mail lines.
- We are closely affiliated with a company that flies 2200 miles of air mail daily.
- Dallas is a live, hustling city of 300,000.
- Bus line from Love Field to city. Fare 10c, half hour schedule.

What we say is so. We never misrepresent. Our graduates are our best boosters.

WHY PAY MORE?

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$ 595
Private Pilots' Course	$ 545
Amateur Pilots' Course	$ 350
Master Mechanics Course	$ 300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five per cent from the above prices for payment in full at time of enrollment.

We are finding employment for our graduates . . . forty placed in good jobs during the last 120 days. What other school can do this?

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

These special inducements are for you — Now! Write or wire for Catalog and full instruction.

USE THIS COUPON:

DALLAS AVIATION SCHOOL AND AIR COLLEGE
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

Transport Pilot ☐ Master Pilot ☐
Limited Commercial ☐ Master Mechanic ☐
Private Pilot ☐ Aviation Radio ☐
Complete Radio ☐

Name.....
Address.....
City.....
State.....

DALLAS

AVIATION SCHOOL AND AIR COLLEGE

LOVE FIELD DALLAS, TEXAS

No. 18 GOES TRAVELING

Another Douglas Transport—production model No. 18—has added a new chapter to the record of these outstanding commercial airplanes. Identical to each of the 41 Douglas Transports that has been produced to date, No.18 in flying from London to Melbourne with passengers and mail for K. L. M. over much of the airline's regular route, has demonstrated to Europe what America already acknowledges as the supreme achievement in commercial transportation.

DOUGLAS TRANSPORT

"Head into the wind"

your engine will always roar a welcome to any wind — when she flies with Texaco!

SPECIAL MESSAGE TO DEALERS!

Texaco Aviation Products are profitable to sell. The demand for them is steadily increasing. Write to The Texas Company for details on this important money-making proposition. Address department E 11

The exceptional lubricating qualities of Texaco Airplane Oils will reduce frictional drag and increase engine pull. They will maintain pressure under all extremes of operating conditions. Their purity and resistance to sludging will lessen overhaul expense.

Important leaders of commercial aviation such as "TWA," "EASTERN" and "NORTHWESTERN AIR LINES" have proved that MARFAK is the finest lubricant tested for rocker-arms. It lubricates effectively. It minimizes wear and will not throw out.

Texaco Aviation Products are available at airports everywhere. And Texaco Engineers will gladly cooperate with you in selecting fuels and lubricants best suited to what you ask your ship to do.

THE TEXAS COMPANY
135 East 42nd Street • New York City

TEXACO

TEXACO AIRPLANE OIL ★ TEXACO AVIATION GASOLINE ★ TEXACO MARFAK
TEXACO ASPHALT PRODUCTS (for runways, hangar floors, aprons and dust laying)

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER FIVE

Contents for November

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

COVER DESIGN

New Boeing 247-D Transports Powered by Two P & W Wasp S1H1-G Engines Each Developing 550 Horsepower at 8,000 Feet

Published monthly by the Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy, 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5.

A large cargo of air express being loaded aboard a Douglas plane of General Air Lines which operates between Salt Lake and Los Angeles. Connections at Salt Lake with United Air Lines, flying Boeing transports, speeds air traffic 2¾ hours faster over the mid-continent route from Los Angeles to New York. Both types of planes used on the speeded-up service are counterparts of the American-built planes which showed such remarkable performance in the 11,323-mile London-Melbourne race, the Douglas winning second place and the Boeing third

AIR

Hot and Otherwise

FRANK A. TICHENOR

● The meddlers are in the mire! What are the grand army of self-appointed aeronautical authorities going to say now about the inferiority of American aircraft? What are the Farleys and the Blacks and the rest of the finger-in-every-pie politicians going to shout now about the corrupt and retrogressive American air mail system which produced the Douglas and the Boeing?

After the London-Melbourne race, they haven't a leg to stand on. They may think they have, but they're only feeding the fool that's in them. That race was an out-and-out victory for the American aircraft industry. It wrote boldly across the map of three continents that American transport planes are beyond doubt the finest, fastest, most efficient and most reliable in the entire world. And everyone with an iota of aviation knowledge admits as much.

Superficially, of course, British pilots in a British plane won the race. Moreover, there's no denying they flew a magnificent race, and flew it doggedly and courageously. But think of this before jumping to conclusions—they flew a special racing plane; the Dutch team and the American team both flew stock American airplanes exactly like those being used day in and day out on America's airlines. The British pushed their engines all the way, straining one of them to the breaking point. The Dutch and the Americans held their Cyclones and Wasps down to cruising *r.p.m.* The *Comet* carried only pilot and co-pilot. The Douglas carried a crew of four and three passengers. Scott and Black landed at Melbourne unshaven, verging on collapse. Parmentier and his co-fliers stepped from their Douglas bathed and fresh. The British *Comet* took the shorter route and made only *five* landings. The K.L.M. Douglas followed the handicap course, which was a thousand miles longer, and made *sixteen* landings.

Scott and Black were fortunate enough—and, we praise where praise is due, expert enough—never to have gotten off course during the entire race. Both Parmentier and Turner got badly lost; and Parmentier was forced down by a terrific storm 200 miles from his goal, spending the night on the ground before he could get off again.

Yet, despite these factors in favor of the *Comet,* the Douglas was only a little more than 19 hours behind in landing at Melbourne; and the Boeing, about 23 hours behind. A second British *Comet,* which, like the Douglas, followed the longer handicap course, came in nearly 30 hours after it, and a third never got there at all.

So draw your own conclusions, not only about the quality of American production aircraft, but also about the upright purposes of the politicians and non-flying Army officers who have been spouting their slurs and slush at American aeronautics. In spite of gentlemen of this ilk, civil aviation in this country has forged ahead of the rest of the world. Think what it might do if they would quit their meddling, if they would leave it alone to grow as it should!

After such a demonstration, in which the mouthings of the ignorant have been refuted on the proving ground of the world, it is time these investigators and self-constituted judges were themselves called on the mat and made to explain what they are really up to. And not only the noisier ones. There are plenty of political appointees behind the scenes messing into and interfering with the activities of the Government aviation experts who are conscientiously and unselfishly trying to develop American aeronautics to a position of world leadership. They, too, might be asked to explain their conduct.

We in aviation cannot afford to deceive ourselves any longer. We cannot build aviation to its destined heights if we continue, as we have too often done in the past, to play politics against politics.

Of one thing you can be absolutely sure—whenever aviation finds itself in a position where it must stoop to political stratagems, it finds itself so placed principally because some politician has special interests to serve or selfish ambitions to achieve. When "duly elected representatives of the people" begin bellowing their nescient philipics on aviation, you can usually be sure they are either thinking of re-election or they're trying to divert public attention from some condition truly dangerous to the public welfare, but beneficial to their own welfare. When non-aeronautical cabinet officials and departmental appointees put their foot into aviation matters, you can also be pretty certain that they are serving some master who is afraid of aviation and is fighting to squelch it.

In the President's Aviation Commission, we now have an opportunity to extract ourselves from the clutches of these interests, and to free ourselves once and for all from their henchmen.

In the opinion of AERO DIGEST, this is the most important thing the Commission can do for American aviation. Judging from the testimony at the open hearings, it is also the thing the industry is most anxious to have the Commission do. Repeatedly, representatives of the industry have urged the present Commission to recommend the creation of a permanent air commission, for in such a body they see a chance to get away from the confusion and injustices which arise in the wake of politics.

It now appears quite certain that such a permanent commission will be established. We believe it should be—provided it is wisely set up. Properly constituted, it should act as the umpire of aeronautics. Carelessly planned, it will merely turn out to be another player kicking aviation around as a political football.

Primarily, it must be non-political. At least, bi-partisan. Its members must be appointed on a continuing basis so that the appointments will overlap from one Federal administration to the next. It must be representative of all the major phases of aviation, and its members must be men who *know* aviation, and are ambitious for aviation, not for themselves.

Such a commission would be qualified to function as the supreme court of American aeronautics. Granted authority to judge in behalf of aviation, to determine broad national policies for aviation, and to advise or call to task the government departments vested with the execution of those policies, a commission of this character would be beyond the reach of political influence and out of earshot of the Farleys, the Blacks, the MacArthurs and the Nyes.

So, in conclusion, we say to you, Mr. Howell and your fellow commissioners, —if you would end the present confusion, if you would promote the great future of aerial America, give us a body of intelligent, air-informed and disinterested men who will have the good of aviation at heart and who will be competent to sit in judgment of its problems. Free us from the blight of the ignorant, the prejudiced, the self-seeking! We are confident that that is the objective you of the Commission, as well as we of the industry, hope to attain.

Utility of Modern Private Airplanes

JOHN B. MOLITOR

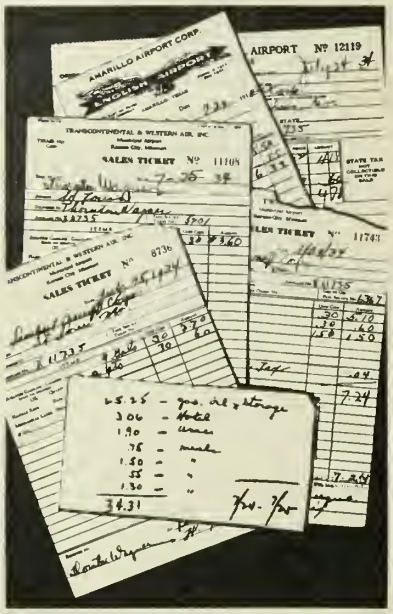
Sales Manager, Lambert Aircraft Corporation

● Many splendid and constructive suggestions and criticisms have appeared in the pages of AERO DIGEST and other media of the industry, concerning the sale and servicing of airplanes to the private owner and operator. As a whole, they have been well taken by the industry. From the ranks of the buying public, however, the question often arises . . . "Oh, the airplane is okeh for the man—or firm—with money enough to experiment. But tell me just how sky riding fits in with the picture of the average person trying to peddle such commonplace stuff as shoes, grinding stones or lead-pencils."

The question is fair; and all too often, it is countered with the reaction from the average airplane dealer that it *is* difficult to find a wide enough market for airplanes in general to keep sales at a profitable level! Not *every* dealer takes this attitude, we are glad to say. If they did, it would place the industry in a precarious and somewhat unstable position. But enough of them are saturated with the closely-drawn-limitations-of-the-market idea, expressed or unexpressed, to create a vital factor in the problem of less sales than there should be, even with present conditions considered.

If the proof of the pudding is in the eating and we may be permitted to cite examples from our personal experiences, let us submit evidence of how some airplane owners are utilizing their ships for both personal and business purposes. And we venture the opinion that for every type of owner described and pictured, there are myriads more who can and will be sold.

A glance at the accompanying photographs will reveal one type of low-priced airplane, as utilized in a dozen different private and commercial requirements; international racing and private airport hopping; foreign exploration and spare-time dove shooting at home; political campaigning, and the travel necessary to the business of selling washing-machines.



Purchase slips covering expenditures by two persons on a two-day, 1500-mile business trip by air

Taken as a group, these evidences of all-around usage would indicate that there is not, after all, too close a line to be drawn as to the field in which the airplane can effectively and pleasantly be used.

For example, in the fleet of privately owned airplanes drawn up on the flying line at Patco Field, near Norristown, Pennsylvania, are twelve ships flown practically every day in personal or business *utility*. Mr. W. D. Mason of the Sun Oil Company at Marcus Hook, owns the plane nearest the camera. Oil men have to get around, and Mr. Mason is quite content with the twenty-two miles to the gallon he gets in his flying operations. Note the automobile terminology! Next in line is the airplane of T. W. Berger of Philadelphia, who keeps flexible in his traveling because the business of selling household appliances makes him do so. A student in the University of Pennsylvania flies the third ship, Lewis Bremer 3rd of Philadelphia. Mr. Bremer flys because he likes to, and there are many other University students who are becoming more familiar with this business of aviation. Other planes of the group belong to Henry A. Little, Jr. of Haverford, who sells them and naturally flies in his business; Karl Howard, an executive of an eastern steel corporation; Dr. T. McKean and Attorney W. L. Henry, Philadelphia professional men; Walter Dean, a prominent business man of the same city; and the Philadelphia Air Transport, commercial operators.

Here, in one locality then, are evidences of the fact that low-priced and economical aircraft do have a very definite appeal to the private operators. Furthermore, it is interesting to note that salient in their considerations is the factor of efficient transportation at low cost —a factor which we, as manufacturers, consider of paramount importance in our own schedules of moving about the country. Quite a bevy of private prospects would be interested in flying let us say, from St. Louis to Los Angeles on a normal business trip, for a total cost of $34.31 for two men, including time out for considerable demonstrating in Kansas City from the 15-hour 40-minute flight.

The purchase slips illustrated bear mute but effective testimony to economy which is sought for by hundreds of prospects who want utility. We've described a few. Here are others whose cases can be duplicated, generally by the score.

In Oklahoma City, a hotly fought race for public office terminated just a few weeks ago. Outstanding in the contest was the splendid showing of Joe Bates, a

A dozen light planes with as many different flying utilities. A study of private ownership at Patco Field near Philadelphia

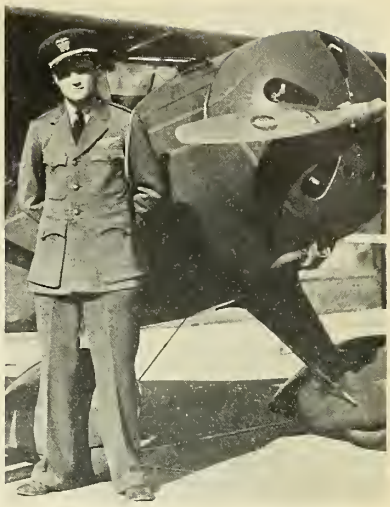
local attorney who sought the office of Attorney General. New to the field of politics, Mr. Bates made a business of his campaign by placing premier importance on quick coverage of the state's vast areas. Conducting his battle by airplane, Mr. Bates dove down over farms in his Monocoupe, scattered circulars from the cabin window, and then landed in nearby fields to speak to the followers assembled by his unique methods. Somewhat sensational? Yes! But his tactics brought results for a first-timer, as the records will prove. There are always elections.

On October 4th, Jack Wright of Utica, New York and John Polando of Boston sailed on the *Olympic* to participate in the MacRobertson Race from London to Melbourne. Their ship, powered with a 145 h.p. engine, will provide them with a top speed hitherto achieved only with engines of at least twice that power. And yet their fuel consumption is only nine gallons per hour at cruising speed. Still utility, and proving that even in the racing category, the economy ratio applies directly and indirectly.

In Washington, D. C., an airplane brings Lt. George H. Moffett, U.S.N., 30 miles from his home near Leesburg, Virginia to his desk in the Bureau of Aeronautics in 17 minutes—a round-trip commuting every day regardless of weather. "I like it," he states, "because tramping the corn fields for dove is my hobby, and Washington is my duty. I can have my cake and eat it too, because five gallons of gasoline just about runs me two days of going and coming." How many more such commuters are there to be found in the country?

Take for example the 10,000-mile exploration trip recently completed in Mexico and Central America by two youths—Bob Buck and Bob Nixon. In Buck's latest book, "Battling the Elements" may be found the tale of accomplishments with their small plane; but suffice it to say that loaded with men, tents, knapsacks, canteens, axes, guns, cameras and film, art supplies, clothes and first-aid kits with everything from sutures to snake-bite serum, they took off from elevations of 7500 feet without difficulty and flew over 14,000-foot mountains. Richard and Alice duPont only recently completed a pleasure trip of similar length, flying their seaplane down to Brazil and return with interesting side trips into the equatorial jungles. The average John Public wouldn't be taking such trips; but it's interesting to note just how the large city commuter could use his ship if his adventurous spirit ever got the best of him. There are lots of average mortals who would like to give vent to their suppressed romantic urges with flying equipment that would do the every-day, as well as the unusual job. The time will come when many others will take trips like these, maybe not for exploration, but certainly for a vacation or for the sheer fun of visiting far-off and interesting lands. With a good airplane and a little bit of common sense, anyone can go a long way nowadays.

Duty in the busy city by day—at night the quiet tranquillity of the country. Lt. Moffett and his airplane



Robert Glass of Dallas uses his ship in box office promotion for the string of motion picture houses he owns in Northern Texas. Another owner in California flies dairy products to towns every morning; and still another in Chicago makes time-saving contacts with his wide-spread accounts in the advertising agency business. These are not all. The vast area to be covered with as little as possible loss of business time has attracted innumerable industries to the airplane. The Kreuger Brewing Co. of Newark, N. J., has been using the facilities of the airplane in conducting its sales campaign in the south, covering most of the important cities; Muessel Brewing Co., South Bend, Ind., has sent its sales manager by plane on a 10-day trip, which extensively covered many states, reaching as far south as New Orleans. The Rochester Photo Supply Co., of Tulsa, Okla., has purchased a plane to facilitate delivery of its products to any part of the state, finding in this mode of transit, a means of speeding-up supplies ordered by oil field operators.

Airplanes as the *modus operandi* of sales in a large land development project in Washington is planned by the Puget Mill Co., Seattle which is negotiating a development program for 16,000 acres of land north of Seattle. Already owning one plane, executives of the company are contemplating the purchase of others for the use of company officials and employees in their sales promotional work.

C. C. Anderson, manager of a 773-acre walnut tract, 10 miles from Stockton, Calif., runs the orchard from the air. Every day, during the growing season, he flies over the fields to check the flow of water in the irrigation ditches, the spraying operations, the appearance of the trees and other details. He can do in one hour or two a job that would require a week or more of steady hiking.

Utility of the airplane does not end with business and pleasure, for it extends into the more sombre aspects of the law. In the hunt for Dillinger, "Pretty Boy" Floyd, and other notorious bandits and kidnappers, the airplane has played its part, speedily and well. The Nassau County Police, of New York, and many others, have purchased planes in which they can apprehend criminals, or bring back those already apprehended in other counties or states.

Dr. J. D. Brock of Kansas City will complete, on November 15, five consecutive years of private aircraft operation, in which he flew every day regardless of weather. Dr. Brock owns and operates three airplanes and uses them for everything from his personal travel needs to commuting to his modern and up-to-date ranch in southwestern Missouri. He writes, for instance: "I flew my Lambert (Monocoupe) down to the ranch yesterday, making the run down, direct airline

(*Continued on page* 68)

Bob Buck on the island of Cozumel off the coast of Yucatan, base for an exciting Mexican Mayan expedition

Paint and the Airplane

LONORE KENT

Director, Save the Surface Campaign

While new principles in aircraft finishing have not been numerous in the last few years, regular advances have been made in composition of material, methods of application, and longer life in protection and performance, until aircraft finishes today can be considered equal to those used in the automobile business.

Dope, varnish and lacquer have repeatedly changed their characteristics, although the fundamentals on which dope formulas have been based for several years remain basically unchanged. Research and development work have produced finishing products far superior to those of even two years ago.

Synthetic resin materials are beginning to find considerable favor in various fields. Some of these synthetic products, generally speaking, tend to give a finish with qualities of adhesion, toughness and drying speed not found heretofore.

Protective Coatings for Duralumin

Discoveries made by the Institute of Paint and Varnish Research Laboratories in Washington, have revealed zinc chromate pigment in combination with synthetic resin liquids to be an ideal primer for resisting corrosion and producing good adhesion. These experiments, carried on over a period of years from 1917 to 1924 by Dr. Henry A. Gardner, director of the laboratory, have revealed among other things, that even duralumin must be covered with some protective coating to avoid corrosion and pitting resulting from exposure to salt water. Further, these tests revealed that a basic pigment could be included as a component part of the protective coatings for duralumin and similar alloys, with highly satisfactory results.

As a result of these tests, Dr. Gardner designed a primer for duralumin. This consists of zinc chromate and red iron oxide (two pigments which gave excellent results) finely ground to a stiff paste in linseed oil (for elasticity) and then reduced with synthetic resinous varnish and drier. The thin consistency, when applied to duralumin surfaces, gives a fairly quick-drying coating.

The U. S. Navy, with its salt water exposure problem, has been experimenting with two new kinds of primer, one of which is a lead chromate glyceral phthlate over which is a gray enamel of glyceral phthlate. Iron oxide in a phenol formaldehyde liquid has also found favor in the Navy for use on hulls, covered by a gray enamel using the same type of vehicle. On metal parts of the engine where heat must be considered, it has been found that glyceral phthlate offers good heat resistance.

Problems raised by the all-metal ship when it first appeared are still extant, but much progress has been made by paint manufacturers. They have been aided materially by practical suggestions from men in the overhaul and repair bases of many transport lines and in the Bureau of Air Commerce of the Department of Commerce.

Colorful in new distinctive painting, Boeing P26A's of the 95th Pursuit Squadron

The metal alone, anodized and not treated with any protective covering, has not entirely proved its case in service. The problem of formulating a paint that will stick to aluminum or duralumin has been practically solved by the anodizing method, since this treatment leaves a "tooth" to which the paint will adhere.

Anodizing is an artificial electrical oxidation process by which corrosion is begun and arrested, leaving a protective oxide film on the surface. The new synthetic primers are especially effective on anodized surfaces.

Perhaps the largest job of anodizing was done in the Boeing plant in the construction of 60 type 247 transports. This was probably the first effort at quantity production of this nature. and for a long time the treatment room, housing several tanks in which large sheets and small parts were suspended, was in operation 24 hours a day, turning out about 44,800 square feet of work daily.

Some aircraft manufacturers regard paint on all-metal planes as not entirely necessary; others, however, insist on paint first for protection, and second because the average American wants a plane as good-looking as his automobile.

Government safety requirements dictate wing-top colors for purposes of high visibility, even in military planes which in wartime would be camouflaged. As private traffic increases and crowded conditions arise at airports, it is probable that government color regulations will be laid down for private planes.

The new planes ordered by the Department of Commerce have international orange on the top of the wings, chrome yellow on the under sides, and fuselages of lustrous black. While these colors were not selected primarily because of their visibility characteristics, it is believed they will be easily discernible under most conditions.

Painting Metal Airplanes

The un-colored duralumin plane, now popular on airlines where utility is the first consideration, will not be popular among private owners, experts believe. Painting these planes constitutes a challenge to paint manufacturers to develop a system which will permit a few coats of very light weight, good hiding and durable finish.

Privately-owned fabric-covered planes will probably always be bright and varicolored. The gloss finish, obtained by standard methods of doping, sanding, rubbing, etc., and retained through the usual method of polishing, makes a great variety of color combinations available and assures the private owner of individuality in the appearance of his plane. This type of finish is also suitable for the all-metal plane. Beautiful but inexpensive automobiles, made possible by the American method of quantity production, will cause the private owner to demand beautiful airplanes.

The high gloss finish has been secured by several methods and by various manufacturers. One leading designer, for example, uses a process in which an oil base varnish is used for the finishing coat, giving a very glossy finish. Another designer builds up the final coat with clear, pigmented dopes, and then

(*Continued on page* 28)

The Amazing Adventure of the Punctured Major General

●

CY CALDWELL

Muddled Mansions, where the destiny of our nation while at war is laid down, and sometimes out. . . . .

● "Dear me, Watson!" exclaimed Mr. Sherlock Holmes, tossing the *Times* aside and casually giving himself a shot in the arm, "London is becoming too quiet and law-abiding for the comfort of a criminal investigator. Absolutely nothing in the papers these days. By the way, will you request Mrs. Hudson to prepare a dozen mutton chops, a rasher of bacon, a plate of eggs, a dozen kippers, and a dish of tea for a light breakfast at six o'clock?"

I was about to reply when a double knock sounded at the street door, followed by a sound of voices as Mrs. Hudson ushered the visitor to our rooms.

"It's Inspector Lestrade of Scotland Yard, Mr. Holmes," said Mrs. Hudson.

"Come in, come in, Lestrade," cried Holmes. "What chance brings you here? Watson and I were about to go for a swim in the Thames. Will you join us?"

"Not to-night, thank you Mr. 'olmes," replied Lestrade. "As a matter of fact, I've come to request your assistance in a matter of extreme h'importance. Major General Sir Benjamin Chummy-Chumley Foulois, Chief of the Air Corps, 'as just been found with a knife in his back. Attached to the knife was a card on which was written, 'With the compliments of the General Staff!' Now what do you make of that, Mr. 'olmes?"

"Watson," cried Sherlock Holmes suddenly springing into action, "ask Mrs. Hudson to prepare a light snack—say a round of cold beef, a ham or two, a couple of capons, a few larded ducks, and a loin of cold pork. Of course you will accompany us, Watson; your patients may recover in your absence. Where was Sir Chummy-Chumley found, Lestrade?"

"In 'is chambers at Muddled Mansions, 'eadquarters of the War Department, Mr. 'olmes. He was unconscious, with 'is 'ead lying on a copy of the Baker Board's report. At first it was thought that the report 'ad put him to sleep, and then the knife was discovered. At present 'e is resting comfortably—as comfortably as one can with a knife in 'is back."

"They're Off!"

In a few minutes we were out of the house, buttoning our ulsters as we ran down the steps and Holmes summoned a hanson cab. "Muddled Mansions, the War Department," he ordered.

"Lor' lumme, y'r h'onor," cried the cabby, peering down at us through the trap, "me an' this 'ere 'orse ayn't bin a blinkin' mile awye from Piccadilly Circus in nigh onto 'arf a century." He then whipped up his horse, and we tore through the deserted streets of London at better than four miles an hour.

I must have dozed off, for suddenly looking out I found that our cab was just drawing up at that grim pile named Muddled Mansions, where the destiny of our nation while at war is laid down, and sometimes out. Not a light was visible in the ancient building before which a couple of stone lions, a dozen cast iron cannon and a few stands of ancient muskets typified the advancement which the War Department had effected in the art of Warfare. Engraved in stone over the doorway were the words, "PER ARDUA AD ASININITY," which, translated freely into the vernacular means, "By work toward further foolishness," or something like that. It was all very impressive and slightly dull.

"Bring the provisions, Watson," whispered Sherlock Holmes as he got out of the cab. "Be sure your revolver is loaded. Come, Lestrade—hurry, hurry!"

The Unwelcome Visitors

As we knocked on the door, I could see that Sherlock Holmes was laboring under suppressed excitement. "Remember, Watson," he whispered as steps resounded through the corridor inside, "we can't trust any of these General Staff fellows; they are desperate characters, every one of them, and they will stop at nothing to hold their jobs."

The door was opened a crack and a very ancient servitor, probably a decayed Quartermaster Sergeant, peered out at us. "'Oo is ut?" he inquired.

"H'it's h'us," replied the Inspector, "Inspector Lestrade and Mr. Sherlock 'olmes, and Dr. Watson, on h'official business from Scotland Yard about the blinkin' knife that was found stuck in the back of Major General Sir Benjamin Chummy-Chumley Foulois."

"I won't say as 'ow you're welcome," remarked the decayed servitor sourly, "but I suppose as 'ow you'll 'ave to come in. This way, gentlemen."

"Will you wait in the library?" said the old man, ushering us into a commodious room with a stuffed admiral in one corner and a petrified Ex-Chief of Staff in the other. By the light of a fire burning in the rusty grate I could read a few of the titles on the books, such as Crossing the Delaware with Washington, Crossing the Alps with Napoleon, and Double-Crossing the Air Corps with Gusto. There were several learned treatises on archery, on hurling stones with sling-shots, on the use of the arquebus, on how to build moats, and other subjects pertaining to modern warfare, as the science is understood by the General Staff.

"This way," said the old man, suddenly appearing with his candle, "the General Staff is in conference and command your presence. Walk quietly and don't speak loudly—they don't like to be awakened."

We entered a large room with a huge mahogany table in the center surrounded by an array of sofas on which several very, very old gentlemen in uniform were calmly sleeping. They looked very peaceful and harmless, lying there in the light of candles stuck in the necks of empty whisky bottles.

"Just to think, Watson," whispered Sherlock Holmes, "it is these old chaps who run our Army in time of war! Fortunately, the generals on the enemy's side always are as decrepit as our own, so nobody has an advantage. We had a young general once, a fellow named Billy Mitchell, but he used to romp around and play, and make noise at these conferences, so they threw him out."

Taking his microscope from his pocket, Sherlock Holmes examined each general carefully, then shook his head and whispered, "Only the faintest signs of life in any of these old codgers—none of them have the strength to shove a knife into Sir Chummy. Mind you, the idea may

(*Continued on page 70*)

Wings for Our Foreign Trade

EVAN E. YOUNG
Vice President, Pan American Airways

● America's first "aerial" trade mission, composed of representatives of the United States Government and some of the nation's leading publishers, recently completed an epochal 15,000-mile flight aboard the trans-ocean type *Brazilian Clipper* to the countries of the West Indies, and eastern South America. Graphically demonstrating the powerful commercial force our international air transport system has become, this flight established not only a series of significant aeronautical record achievements but also is recognized as having accomplished, in positive results, far more than all the goodwill missions which in recent years have been dispatched as part of a nation-wide effort to maintain a "better understanding" and increased commercial advantages between the industrial areas of the United States and the world markets to the south.

Fresh from its long series of test flights at the Sikorsky factory in Bridgeport, during the course of which it reclaimed for the United States the ten world efficiency records for seaplane transport performance, all of which have for years been held by France and Germany, the 19-ton, four-engined, 32-passenger airliner departed from Miami on August 15 for a transport test flight to Rio de Janeiro, Montevideo and Buenos Aires. Under strict operating procedure, 11 days were allowed for the complete flight, with scheduled stops to be made in 12 countries, and with stop-overs of two days each in the capitals of Brazil and Argentina.

Flying northward with that same speed that had brought the airliner over the western rim of the Atlantic to the River Plate and back, faster than this distance had ever been negotiated before, the *Brazilian Clipper* landed in Miami a full hour ahead of her 15-day schedule, adding the final line to the closing chapter of an epochal inaugural program that is probably one of the most significant commercial flights in the history of aviation.

Fifteen days before this newest of Pan American's Clipper ships had left this same port. Eight days before she had been formally christened in colorful ceremonies at Rio de Janeiro. Five days before she left Buenos Aires for the 7,100-mile return flight; and 12 hours before she had departed from South America. In five steps, dawn to dusk apart, she had spanned the east coast of the southern continent from the River Plate and the entire West Indies, to cut two full days from the fastest travel time between Buenos Aires, Rio and the United States. Several of her passengers who were in Port of Spain on Thursday, breakfasted in New York or Washington on Friday. Through 12 countries the *Brazilian Clipper* had left a symbol; to those who made the flight and to the millions of others who followed her progress through the press and radio, she had demonstrated the beginning of a new and greater era in transportation—a new epoch in commerce and friendship between American nations.

Offering as it did the opportunity to secure, in so short a time, a comprehensive first-hand impression of the countries of the West Indies and eastern South America and to observe the commercial, cultural and political conditions which are determining factors in our inter-American relations, the inaugural flight of the *Brazilian Clipper* was organized as a trade mission in the interests of improved inter-American relations for the mutual commercial advancement of the United States and Latin America.

Eugene Vidal, Director of Air Commerce of the Bureau of Air Commerce, who had issued the transport license to the S-42 at Bridgeport, was a representative of the United States Government on the inaugural flight, and made an official inspection of Pan American's operating routes and methods. President J. T. Trippe extended to a group of the leading publishers and executives of the press associations of the United States, who have demonstrated keen interest in America's international relations, an invitation to accompany him on this trade mission.

Part of the crowd which turned out to greet the arrival of the Pan American Sikorsky "Brazilian Clipper" at Rio de Janeiro, Brazil

In addition to Mr. Vidal, the passenger list for the inaugural flight included the following:

Roy Howard, Chairman of the Scripps-Howard Newspapers; William F. Brooks, Executive Assistant to the General Manager of the Associated Press; James H. Furay, Vice-President of the United Press; James G. Stahlman, President of the Southern Newspaper Publishers Association and publisher of the *Nashville Banner;* Frank E. Gannett, Chairman of the Gannett Newspapers, Inc.; Edgar M. Swasey, Vice-President of the *American Weekly;* M. C. Meigs, Manager of the Chicago *American;* Paul Patterson, Publisher of the Baltimore *Sun;* Amon G. Carter, Publisher of the Fort Worth *Star-Telegram;* H. V. Jenkins, Publisher of the Savannah *Morning News* and Savannah *Press;* John Cowles, Publisher Des Moines *Register and Tribune;* and John N. Wheeler, General Manager of the North American Newspaper Alliance.

In addition to President Trippe, Mr. George Rihl, vice-president of the Pan American Airways System, and the writer made the trip.

Itinerary of the Trip

In striking contrast to the runs of the original Clipper ships, as well as to the long distance steamer journeys with which America's trade has, before the coming of the air service, been developed, the *Brazilian Clipper,* flying at 160 miles an hour, spanned Cuba, Haiti, Santo Domingo and Puerto Rico between breakfast and dinner on the first day. In eight hours on the second day, passengers were in and out of the entire arc of the lower West Indies, Trinidad and into British Guiana, a port 15 days from New York by fastest steamer service, and on the third day they landed at Para, 4,800 miles from New York. The fourth day, stopping in and out of the ports of northern Brazil, brought them to Natal, the base to which both French and German flying boats are being speeded across the South Atlantic to wrest from the American airlines the speed leadership on the aerial trade routes of the Far South. The fifth day took them to within 40 miles of Rio de Janeiro to Capo Frio where a landing was made because of fog and unfavorable weather conditions, a landing which, itself, was a graphic demonstration of the safety first policy which has secured for Pan American such an outstanding performance record.

Early on the sixth morning, the *Brazilian Clipper* rounded Sugar Loaf Mountain and came to a landing in Botofoga Bay in the Brazilian capital, nearly two days faster than the trip from the United States had ever been made before. There, in the presence of high government officials of many nations the airplane was given its name by Senhora Getulio Vargas, wife of the President of Brazil, and dedicated to Pan American service.

After two days in Rio de Janeiro, the flight continued to Montevideo and Buenos Aires. Two more days spent in Argentina and the ship and its passengers turned north again, flying up the coast from Buenos Aires to Miami in the impressive time of five days.

Organized without fanfare and conducted as quietly, the trade mission flight of the *Brazilian Clipper* made a profound impression through all of the countries visited. Official functions for the party were scheduled everywhere and, recognizing the sincerity of the members in securing more intimate understanding of Latin American conditions, every opportunity was provided whereby in the short time available, the party could secure first-hand and intimate information on the subjects which most interested them.

While cynics are inclined to scoff at the idea that there is any importance in goodwill missions, other observers have asserted that Argentine-United States relations have suffered severely in recent years because of an absence of just such personal contacts as the *Brazilian Clipper* party established.

Argentine and Brazilian Government officials welcomed the opportunity of exchanging ideas with the men aboard the plane, and the newspapers devoted many pages to their opinions on all manner of questions. These interviews impressed the general public with the idea that the important men of the United States really are interested in Argentina and United States relations with the Argentines.

President Justo of Argentina chatted informally with members of the party who spoke Spanish, asked innumerable questions and was keenly interested in the replies. American ambassadors made every effort to bring members of the party into close contact with Argentine officials as often as possible.

Foreign Minister Saavedra Lamas of Argentina said he hoped there would be similar visits frequently by prominent Americans, now that the Clipper plane had cut down the travel time to the limits within which business men could be away from home. The publishers frankly expressed their surprise at what they found and saw in South America, and came back convinced that there is an important field in South America for profitable, as well as friendly, relationship.

Time for Winning Markets

South America, especially Argentina, is, therefore, more receptive to American goodwill gestures now than at any time in recent years, and the *Brazilian Clipper* party is convinced that the time is ripe as probably never before for the United States to win a permanent place in South American affections and markets.

The newspapermen on their flight down the southern hemisphere crossed Cuba, Haiti and the Dominican Republic—always good customers of United States' manufacturers—crossed Puerto Rico and the Virgin Islands—American territory—visited Trinidad—from where the asphalt comes—touched the Guianas and flew for three days along the coast of Brazil, calling in at ports from which North Americans get their coffee. They visited the cattle and grain countries of Uruguay and Argentina.

Everywhere they touched they were

(*Continued on page* 68)

Presidents Terra of Uruguay and Vargas of Brazil and South American military officials who flew in the "Brazilian Clipper" at Rio

The 11,323-Mile MacRobertson Race from London to Melbourne Within 71 Hours

A DAY-BY-DAY ACCOUNT OF THE EPIC SPEED CONTEST

Wide World Photo

First place: C. W. A. Scott and C. Black

● Twenty airplanes from seven countries were drawn up in two rows on the broad expanse of the Royal Air Force field in Mildenhall, England as the clock neared 6:30 on the morning of October 20. Just 18 minutes later, all had made successful take-offs and the MacRobertson Race half way around the world to Melbourne, Australia, was under way.

First into the air were James and Amy Mollison in a deHavilland *Comet* with two special Gipsy Six engines. Then every 45 seconds, almost with monotonous regularity, the rest of the field got under way. Roscoe Turner and Clyde Pangborn, flying their P. & W. Wasp-powered Boeing 247-D transport were next; then came Cathcart Jones and Kenneth Waller in another *Comet;* D. L. Asjes and G. J. Geysendorfer in a Wright-powered Dutch Pander; T. Neville Stack and S. L. Turner flying an Airspeed A.S. 8 with two Cheetah VI engines; C. W. A. Scott and Campbell Black in a third *Comet;* K. D. Parmentier and J. J. Moll in a Wright Cyclone-powered Douglas airliner; Jacqueline Cochran and Wesley Smith in a Gee Bee with P. & W. Hornet; Jack Wright and John Polando, Warner Super-Scarab-powered Monocoupe; C. G. Davies and C. N. Hill, Fairey III, Napier Lion powered; H. D. Gillman and J. Y. C. Baines, Fairey *Fox,* Felix-Curtiss powered; James Woods and Donald Bennett, P. & W. Wasp-powered Lockheed; J. D. Hewett and C. E. Kay, deHavilland *Dragon,* powered by Gipsy Six; Raymond Parer and Geoffrey Hemsworth, Fairey *Fox,* Fairey-Felix-powered; Michael Hansen and Daniel Jansen, Desoutter *Mark II,* with Gipsy III; H. L. Brook and E. M. Lay, Miles *Falcon* with Gipsy Major; Malcolm MacGregor and Henry Walker, Gipsy-powered Miles *Hawk;* G. Shaw, British Klemm *Eagle,* Gipsy Major; D. E. and K. G. Stodart, Airspeed *Courier,* Cheetah V; and Charles Melrose in a Gipsy-powered deHavilland *Moth.*

Thus started the air race which attracted the attention of the entire world and in the preparation for which almost a year had been spent in making plans for the gruelling flight across three continents.

Less than three weeks before the start, competitors, organizers, aircraft and engine builders, map-makers, shipping agents, handicappers and representatives of many other trades and professions were hard at work. Several of the chief foreign competing teams and their aircraft reached England. Planes built for the races were the center of feverish activity in the factories, where special squads of workmen toiled to bring the racers to the starting point in good time.

International News Photo

The winning plane—Scott and Black's twin-engined deHavilland "Comet"

As the starting date drew near, the original list of 66 starters gradually diminished. Only 21 remained. Technical tests were completed on every plane, assuring conformation to the terms of its certificate of compliance with international commission airworthiness requirements. This meant that each plane was strictly limited as to its maximum loaded weight, that it did not have a dangerously low rate of climb after take-off and that is structure possessed adequate safety factors. The most important of these rules required a plane to clear an obstacle 66 feet high within 656 yards from the starting point.

Adhering to the I.C.A.N. requirements the race committee ruled that Col. James C. Fitzmaurice, the Irish aviator, would not be permitted to operate with the restricted license issued by the U. S. Department of Commerce. They insisted that he carry less fuel, which would have made a substantial decrease in the plane's cruising range. Rather than operate under the handicap, Col. Fitzmaurice withdrew his Bellanca Racer, the *Irish Swoop.* The number of starters was now 20.

Counting pilots and co-pilots, radio operators and passengers, 48 persons participated in the race. Ft. Lieut. G. Shaw of Great Britain and Charles J. Melrose of Australia, flew solo. Seven persons, besides K. D. Parmentier were aboard the Wright Cyclone-powered Douglas airliner while the other planes each had a pilot and one or two co-pilots. Besides three American-built and American-manned entries, the United States was represented by two American-built entries flown under foreign colors. One was the Douglas; the other a P. & W. Wasp-powered Lockheed, flown by James Woods and Donald C. Bennett of Australia. Nine planes carried the hopes of Great Britain; New Zealand, Holland and Australia each had two representatives and New Guinea and Denmark each sent one plane. Sixteen planes were in the handicap race, the balance in the speed event which called for five compulsory stops before reaching their goal.

Those in the speed race were free to fly any course they chose, but had to check in at Baghdad (2553 miles from Mildenhall), Allahabad (4853), Singapore (7063), Darwin (9147), and Charleville (10,536), which is 787 miles from Melbourne, making a total of 11,323 miles. Weather conditions at the start were ideal, and all planes in the speed section

International News Photo

Second place: K. D. Parmentier and J. J. Moll

of the race pointed for Baghdad, the first compulsory control point, 2,553 miles away.

Twelve hours 30 minutes after the take-off, James and Amy Mollison arrived in Baghdad, the first of the racers to reach the first control point. Averaging close to 200 miles an hour, they were leading the field. Reports indicated the Douglas in second place; the Dutch Pander *Postjager* in third place and the Boeing in fourth position. But C. W. A. Scott and Malcolm Black, flying another twin-engined deHavilland *Comet,* who were unreported, came down in Baghdad 12 minutes after the leaders left for Allahabad, India, the second control point, to loom up as a major contender. After refueling, they were off for the next stop, 45 minutes behind the Mollisons. Late in the afternoon of the first day, the Gee Bee flown by Jacqueline Cochran and Wesley Smith was forced out of the race due to a mechanical difficulty. The other planes were strung out over Europe, some making necessary landings for fuel, others hurrying repairs, anxious to get into the air again.

Trouble beset the Mollisons between Baghdad and Allahabad. A faulty landing gear was the cause and while they spent a tantalizing day at Karachi awaiting repairs, Scott and Black passed them. They left Allahabad early the second day and, flying on the great circle course, reached Singapore 39 hours 56 minutes out of Mildenhall.

Parmentier and Moll were now in second place; Turner and Pangborn third. The Mollisons finally got under way from Karachi before Jones and Waller, Britons in another deHavilland *Comet* arrived there. They then were in fourth position. Meanwhile the other Dutch entry, the *Pander* piloted by Geysendorfer and Asjes had been forced out. Up to this point, at least two records had been established. The Mollisons reduced the time from England to India to 22 hours 13 minutes from the previous mark 50 hours. The flight by Scott and Black to Singapore had eclipsed by about 2 days the best previous time, and the Douglas was doing better than anything hitherto accomplished by a commercial plane flying to the East.

Engine trouble threatened to interrupt the flight of the leaders, Scott and Black, and between Singapore and Darwin, one of their engines stopped, necessitating a flight into the fourth (and next to the last) compulsory stop on one engine. After hurried repairs they took off again for Charleville, Australia, 1384 miles distant. When they hove into sight of the airport there, the engine again was dead. Parmentier and Moll, Turner and Pangborn, and Jones and Waller held their respective places as the race neared its finish. Dawn of the third day, saw the Dutch team in the American plane arriving at Darwin, refueling and taking off quickly. Turner and Pangborn, closely pressing for second place, landed there a few hours later far ahead of the fourth-place Britons who had not yet reached Singapore.

By this time, the Mollisons announced their withdrawal from the race; disaster overtook Gillman and Baines in Italy and the rest of the field was still scattered from Europe to Asia.

Mechanics feverishly adjusted the bad engine on the leading *Comet,* but after flying out of Charleville, Scott and Black were forced to return for further adjustments. However, following the second take-off they had just sufficient power to reach Melbourne, 786 miles away, ahead of the field. As they flew over the Flemington Race Course in Melbourne, jammed with 100,000 people, their nearest competitor was 800 or more miles away. They had won the MacRobertson Race with its $2,000 trophy and a cash award of $50,000. Their time from London to Melbourne was less than a minute short of 71 hours. It was the third time Scott figured as a record-maker between these points, this time lowering the record by 4½ days.

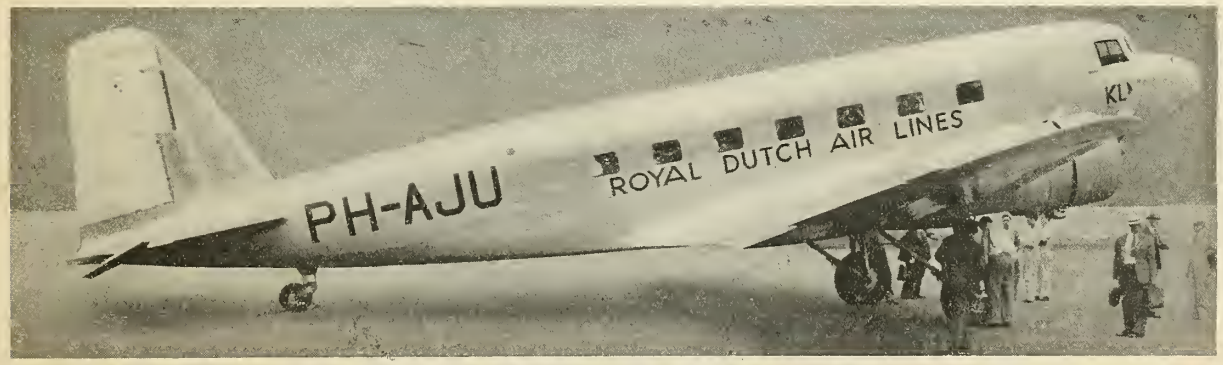
The Douglas and the Boeing both met delays on the last lap. Parmentier, lost in the bad weather, landed to get his bearings and was bogged down for the night less than 200 miles from his goal. Two hundred miles further back, Turner and Pangborn came down to repair a broken oil line. With clearing weather, Parmentier took off for Melbourne, arriving 19 hours 19 minutes behind the winner. Turner and Pangborn arrived 2 hours 44 minutes later while Jones and Waller, still in fourth place, landed at Darwin.

Entries in the race at that time were as far back as Athens where H. L. Brook was awaiting replacement of a broken propeller.

The fourth day witnessed the completion of the race for Jones and Waller who landed at Melbourne, 118 hours 32 minutes out of England.

The map positions of the handicap race fliers afforded no guidance to their positions in the race. They had 16 days in which to reach Australia and their elapsed time was reckoned only while they were in the air or at other than control points.

Hewett and Kay were in Singapore; the Stodarts and Hansen both had gone on beyond Calcutta; Shaw was delayed at Bushire, Persia. Wright and Polando, due to a misunderstanding as to the validity of their clearance papers, were detained and jailed for landing at Mohammerah, Persia. MacGregor and Walker were flying from Batavia; Melrose



Douglas airliner flown by Parmentier and Moll, carrying three passengers, their baggage, a crew of two and 30,000 air mail letters

Wide World photo

Third place: Pangborn and Turner

left Allahabad while Davies and Hill were still at Cyprus. Brook was still awaiting propeller replacements at Athens.

The fifth contenders to reach Australia were MacGregor and Walker who, on the fifth day landed at Port Darwin. Behind them, in that order, were Hewett and Kay; the Stodarts, Hansen and Jensen, Melrose, and Wright and Polando, who were released from custody by the Persian border authorities. The others did not take off, remaining where they were the day before.

Nine other derbyists were still plodding the route as Jones and Waller made plans to backtrack the race course to England. They had hopes of flying the round-trip in eight days, but it was almost a week after they left England that they took off from Melbourne for the return flight. Averaging about 200 miles an hour, they landed in Singapore, taking only 10 hours 20 minutes to cover the 2084 miles from Darwin. If they could maintain that speed, the chances for lowering the Scott-Black record were good.

It was possible that the homebound Britons in the *Comet* (described on page 34 of this issue of AERO DIGEST) would pass another plane enroute to Australia. Despite his withdrawal from the MacRobertson Race, Col. Fitzmaurice decided to fly the race course, aiming at the establishment of a new record from England to Australia. Following the five-control-stop course, Fitzmaurice and Eric W. Bonar, his co-pilot, took off from Lympne, England, in their Bellanca racer on October 29, favored by good weather over a large portion of the route. They planned to fly at altitudes where their supercharged P. & W. twin-row Wasp could operate most efficiently and estimated they would negotiate the 11,323 miles in about 58 hours. Three hours later, however, they were back in Lympne with mechanical trouble which threatened to delay them longer than they anticipated. The expected meeting of the race planes was still probable, for Jones and Waller were delayed in Allahabad by engine trouble. Their halt there and a layover in Darwin apparently robbed them of any chance of setting a new record.

Col. Fitzmaurice withdrew from the MacRobertson Race when he was unable to complete his load tests prior to its start and his plane was restricted at that time to a gross flying weight of 5,400 pounds, the amount considered by the race committee as safe. Subsequently, however, and after the race began, the Bellanca, *Irish Swoop,* received a full certificate of airworthiness for a gross flying weight of 8350 pounds.

The first team entered only in the handicap section and the only New Zealanders in the contest, MacGregor and Walker, landed at Laverton Airport, Melbourne, October 28, the fifth plane to finish the race. At that time, the Stodarts were in Darwin; Hansen had taken off from Batavia; Melrose was at Rambang while Wright and Polando were enroute from Karachi. On the following day, Melrose reached Darwin after a solo flight across the Timor Sea, the Stodarts reached Newcastle Waters, while Hewett and Kay landed at Cloncurry, Australia. Hansen was at Rambang ready for the flight to Darwin while Wright and Polando were delayed at Calcutta by engine trouble.

The Stodards were the next to land in Melbourne, arriving there on the eleventh day after the Mildenhall take-off. From the position of the balance of the field it was evident that, barring unforeseen delays, the youthful Melrose would arrive next. Following them would be Hewett and Kay; Jensen and Hansen and Wright and Polando who at that time were in Calcutta awaiting completion of repairs to their plane. Despite irritating delays, the American pilots were determined to reach Melbourne. If these teams got through, ten of the original starters will have completed the long flight.

As the race entered its final stages it was apparent the American aviation industry was satisfied with the gratifying reaction abroad to the showing made by this country's principal entries. The performance of the Douglas and the Boeing made a profound impression on the public, both here and abroad. If tangible proof was needed, it came in the form of an announcement by the Royal Dutch Air Lines that it had ordered ten sister ships of the monoplane in which its pilots, Parmentier and Moll, had finished such a brilliant second.

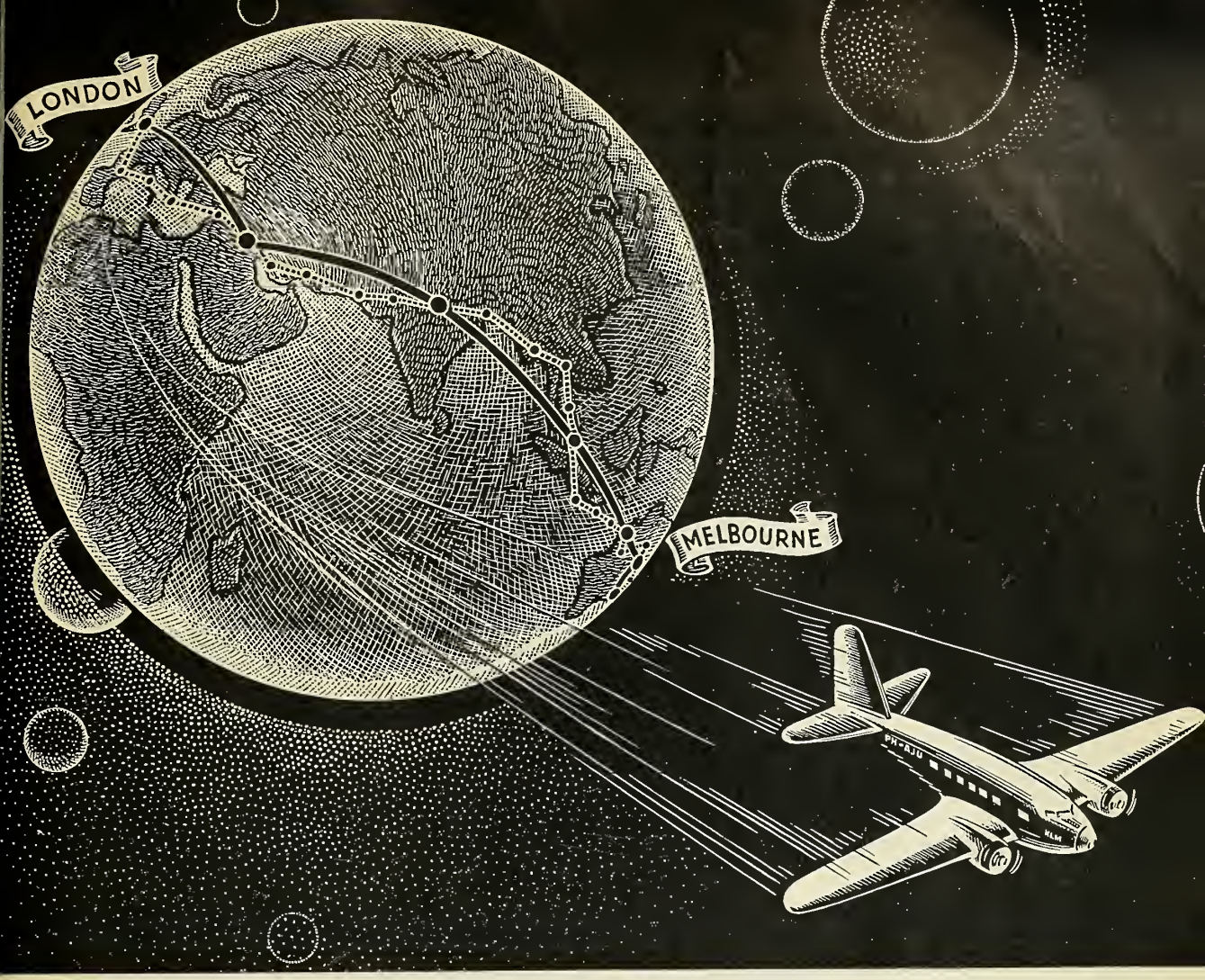
British aviation experts, enthusiastic at the victory of Scott and Black, were first to say that the flights of the two American built and powered transports, were more significant commercially than the flight of the winners.

The intense interest of the entire world in the MacRobertson Race prompted French and American officials to think of similar flights. France announced, through General Victor Denain, its Minister for Air, that it will organize an international air race from Paris to Hanoi, Indo-China during 1935. Modeled directly on the London-Melbourne race, the French-sponsored race will be deliberately intended to stimulate French long-distance aviation and redeem it from criticisms because of France's failure to send any satisfactory planes to London for the race.

A suggestion that the United States sponsor an international air race around North and South America was made by Rex Martin, Assistant Director of Air Commerce, who was in London for the start of the MacRobertson Race. Martin said that upon his return to this country he would broach the idea of an air race, open to all comers, with none of the restrictions which proved so irritating to many intending participants of the race to Australia.

A computation of the Scott-Black flight indicated an elapsed time of 70 hours 59 minutes 50 seconds, averaging 159.1 miles an hour and making six stops. One landing was made at Kirkuk, Persia. Parmentier, on the other hand, made sixteen stops, and had taken 90 hours 17 minutes 30 seconds flying over a route which was almost 1000 miles longer than the one taken by the winners. The American team in the Boeing was clocked at 93 hours 5 minutes 15 seconds.

Turner and Pangborn's Boeing airliner, third to reach Melbourne in the MacRobertson Race



—another Achievement for WRIGHT CYCLONES

Wright Cyclone Engines powered the K.L.M. (Royal Dutch Airlines) Douglas Airliner—winner of the second prize in the London-Melbourne Race—and the first plane to cross the finish line in the Handicap Division.

The K.L.M. Douglas Airliner completed the race in the total elapsed time of 90 hours and 18 minutes. The route of flight covered the entire length of Europe, extended over Asia, across the Equator, the East Indies and the Timor Sea, and transversed the entire continent of Australia—a distance of approximately 12,293 miles—*half-way around the world.* Stops were made at sixteen airports on the long Handicap Route, as compared with only five airports on the Speed Route.

The extraordinary showing of the Cyclone-powered Douglas Airliner represents a magnificent achievement for a stock commercial transport and engines, carrying a heavy payload consisting of passengers, baggage, food and 30,000 air mail letters. It is a combined achievement for the K.L.M. pilots, K. D. Parmentier and J. J. Moll; the Douglas "Luxury" Airliner; and the Wright (Series F) Cyclones, which functioned perfectly throughout the entire flight.

Wright (Series F) Cyclones power all of the Douglas Airliners now in operation on Transcontinental & Western Air, American Airlines, Eastern Air Lines, General Air Lines and the Pan American Airways System. In Europe a large fleet of planes of the same type will soon be placed in service on K.L.M.'s route from Amsterdam, Holland, to Batavia, Java—longest airline in the world—and on Swissair.

WRIGHT AIRCRAFT ENGINES

WRIGHT

AERONAUTICAL CORPORATION

PATERSON NEW JERSEY U.S.A.

A DIVISION OF CURTISS-WRIGHT CORPORATION

WRIGHT AIRCRAFT ENGINES

EDITORIALS

"I have frequently expressed the opinion that no country in Europe is safe in the event of another war. The capital of every belligerent power could be destroyed from the air in a few hours. The same can be said of American cities."—PRINCE GEORGES BIBESCO, President, Federation Aeronautique Internationale.

Permanent Air Commission and New Air Mail Bill Needed

● In reports being made to the Federal Aviation Commission in Washington, some points stand out as particularly significant; they are those mentioned most frequently in the efforts to reach an equitable platform upon which the industry can be placed on a firm basis.

Foremost is the opinion that there should be a permanent commission to regulate commercial aviation in all its phases.

A non-political, far-sighted and fair-dealing tribunal would accomplish much, particularly in keeping the industry out of politics and in helping it grow into a sounder institution. If such a group becomes an actuality (and there is little doubt that it will not) regulation of the non-military activities of the industry would be confined to one body, instead of the various governmental units that have a hand in its operations. The creation of this board would also assure the industry of representation by a group that has its interests at heart and to which alleged abuses could be brought for patient and friendly discussion.

The second outstanding point is the unanimous feeling among the transport operators that the present air mail bill is a pernicious and destructive bit of legislature which is slowly sealing the doom of the American air transport system. It has many offensive features which should be eliminated or revised. Besides removing from the industry those men who had most to do with building it up, it also is unfair in its terms concerning carriage of the mail.

Today, operators are at the mercy of the Post Office Department, relative to the loads of mail they may have to carry. Operators now are unaware, almost up to the take-off time, whether they will be required to carry 100, 500 or 2,000 pounds of mail matter. In many instances they have been forced either to remove paying passengers or run extra sections with less-than-capacity loads at great financial loss.

In addition, the present rate structure can also stand considerable alteration. More equitable terms should be legislated so that a fair profit should be realized by the operators. If for some very good reason, which is not apparent now, all non-local first class mail cannot go by air, then the airlines should be paid a flat fee for carrying a certain amount of mail, the space for which has been contracted for by the Post Office. If regular air mail cannot fill this space, the Department should fill it with ordinary mail, thus avoiding a prohibitive cost for carrying air mail only.

Six Days From New York to Shanghai

● The phenomenal progress achieved by American air transport lines in the ten short years since their inception will approach a grand climax a few months from now when Pan American Airways begins its projected air transport service across the Pacific Ocean. In the span of a single decade, our progressive and energetic companies will have accomplished more than the railroads and the steamships combined took a life-time to do, and which surface transportation never can match in the matter of speed.

By train and steamship the time required for travel between New York and Shanghai, China, is about one month. Think of what it means to cover the distance regularly with passengers, mail and express in less than a week! This is exactly what is promised, and, from past performances of the Pan American Airways, it is exactly what we may expect!

It is reassuring to know that an American company is pioneering in the ambitious program, for several European countries are contemplating or actually promoting transoceanic service. They are aware of the trade advantages and improved diplomatic relations between themselves and countries in the Far East to be derived from such lines. In this country we have already experienced the benefits resulting from the operations of Pan American Airways into South and Central America.

With the present overnight coast-to-coast services and the inauguration of transoceanic service, both cherished dreams of our aviation industry, the present year will go down in aeronautical history as the year in which American air transportation surmounted some of the most difficult old barriers of distance and time.

These advancements are but a beginning. In the not-too-distant future regular airplane service (first for mail and express, and then for passengers), will be maintained across the Atlantic Ocean, completing the chain of an aerial service to girdle the entire globe.

The Railroads' "Challenge"

● On the morning of October 25th, a long yellow worm, the new "wonder train" eased to a stop at Grand Central Terminal. Fifty-seven hours earlier it had pulled out of Los Angeles. Exclaimed the newspapers—the railroads' challenge to aviation!

If the challenge is one of speed, it is meagre indeed. While the streamlined train was crawling one way across the continent, an air passenger riding in a standard transport ship could have flown from Los Angeles to New York, back to Los Angeles, then back to New York again; and still he would have had to wait five hours to meet a friend coming in on the "yellow streak." It was a record-breaking achievement for this train to average less than sixty miles per hour on a unique transcontinental trip; the regular airline planes are averaging between 180 and 200 m.p.h. over the same distance, day in and day out. The coast-to-coast rail passenger aboard the Union Pacific's streamlined express must spend three nights and two days in travel between Los Angeles and New York; the air passenger need spend only one night between the same two points.

An old adage says "Any new form of transportation must be three times as fast as the old to supplant it." If the streamlined train is railroading's best effort in speed, then far from being a challenge to aviation, it is a prophet of aviation's supremacy.

Our Air-Minded Military Colleges

● Both Secretary Dern and Secretary Swanson have expressed the desire that before long every cadet will have the opportunity of becoming thoroughly familiar with flying, and the former has emphasized the wish that some day, soon, every West Pointer will be an experienced pilot.

The action of these Departments is laudable not only because it focuses greater attention on aviation, but also because it places the airplane in a prominent position in the eyes of every soldier and sailor in this country. Greater familiarity with the airplane and with flight should have a decided influence on the future of aviation in the United States.

ANNOUNCING

A NEW HAMILTON STANDARD CONTROLLABLE

FOR ENGINES

IN THE 200 H. P. CLASS

● The availability of a controllable in this power class will enable the alert manufacturer of the smaller planes to incorporate in his 1935 models those features which have made possible the high performance of the new transports now in general service on leading airlines.*

Smaller planes designed from the beginning to utilize the controllable pitch propellers and flaps will show the same relative improvement in speed, safety, and economy as the larger transports which have made America the undisputed leader of the world in air transportation.

The new Hamilton Standard Controllable is, in all essentials, a smaller edition of the propeller which was awarded the Collier Trophy as the outstanding contribution to American Aviation in 1933. Hamilton Standard Propeller Company, East Hartford, Connecticut.

HAMILTON STANDARD PROPELLER COMPANY
EAST HARTFORD CONNECTICUT
SUBSIDIARY OF UNITED AIRCRAFT & TRANSPORT CORPORATION

HAMILTON STANDARD CONTROLLABLES

*Hamilton Standard Controllables are standard equipment on such new transports as the Douglas, Boeing, Condor, Lockheed, and Northrop.

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • DR. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

Mechanical Solution of Aircraft Structures

ANDREW F. HAIDUCK

● In no other branch of engineering endeavor have more precise and accurate solutions been used than in airplane design. The modern stress analysis of the complete airplane is a splendid example. Conservative assumptions are out of place since they usually involve making some members heavier than necessary. However, the rapid strides of the industry, particularly with regard to new types of construction, make it increasingly difficult to save the last few pounds with ordinary methods of analysis. The following outlined mechanical method of analysis has, therefore, obvious advantages.

The Beggs Deformeter method of solving structures is primarily a practical method using elastic models of the structure under consideration. It avoids calculus and simultaneous equations because each unknown is determined as a function of a known load and two measurable deflections. This method lends easily itself to the solution of fuselage bulkheads, curved beams, or arches with varying moments of inertia, effects of gussets as well as any complicated built-up structure.

The principle underlying the use of the deformeter is Maxwell's theorem of reciprocal deflections which states: the deflection of point A of a structure due to a load P, acting at any other point B on that structure, is equal to the deflection of B due to a load acting at A, provided the load and deflection of each joint are in the same direction. Thus the vertical, horizontal, and rotative reaction components are found experimentally, though no actual load is applied. A known displacement, found initially by calibration, is introduced at the point or section of desired stress and the deflection at the point of assumed loading is measured with a micrometer microscope.

For instance in Fig. 1 to find the vertical component of the reaction of A for an assumed load P with the support B fixed, a small vertical displacement d_1 is introduced at A without permitting rotation or horizontal movement of the support. The corresponding displacement d_2 under the load P is observed with the miscroscope. The vertical component V of the reaction from theory is

$$V = P\ (d_2/d_1)$$

The horizontal component of the reaction at A is obtained by introducing a horizontal displacement d_1 at A and measuring the corresponding deflection d_2 under the assumed load P. Again from Maxwell's theory

$$H = P\ (d_2/d_1)$$

The same procedure is used for the moment component of the reaction at support A. The displacement d_1 at A can be considered that at unit radius and d_1 is again measured at point of assumed loading and

$$M = P\ (d_2/d_1)$$

M is the bending moment produced in a structure of the scale of the model. To convert this for the full size structure, it must be multiplied by a factor N, where the scale of the model is such that one unit of length of the model equals N unit of the full size structure under consideration.

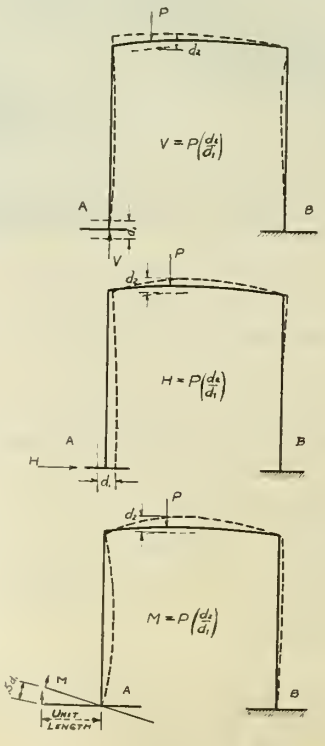


Fig. 1. Theory of the Deformeter

If the load P is considered to be unity and several microscopes are used to observe simultaneous displacements at various points on the model the influence lines for shear, thrust, and moment may be obtained. From this, the effect of a distributed load can easily be found.

A standard deformeter set consists of six deformeter gauges, three micrometer microscopes, and all accessories required for analyses by models. Fig. 2 shows a typical setup with two gauges and three microscopes, and a celluloid model. The deformeter gauge consists of two parallel steel bars with pairs of opposing Vee notches held together by coil springs allowing small relative motion between the bars. Precise gauge plugs of accurately specified sizes are provided for introduction between the gauge bars to produce predetermined amounts of thrust, shear and moment displacement. The fixed bar of the gauge is screwed to a board. The model is attached to the movable bar of the gauge by a clamp if the support is assumed fixed or by a needle point if assumed hinged. The known displacements introduced by the plugs at the gauges and the measurement of deflection at any point through the micrometer microscopes furnish all of the data needed to find the effect of any applied load P on the thrust, shear or moment at the section according to Maxwell's law.

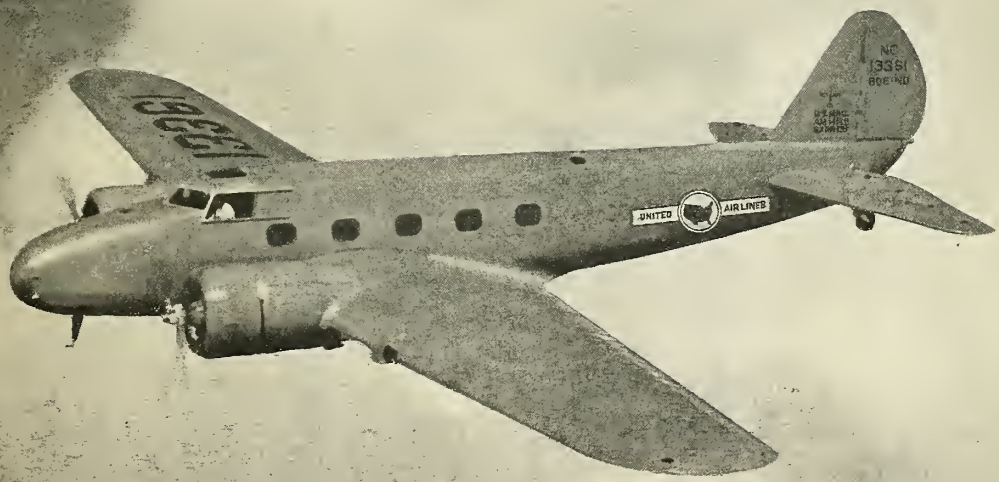
The author has checked the use of this method with the setup shown in Fig. 2. The investigation was conducted primarily to prove the feasibility of this method as well as to find the effect of the jury strut in the lift truss of a high-wing, externally-braced monoplane. A 1/10 scale cardboard model was first cut out and preliminary tests made. The depths of the various members of the model were made proportional to the $\sqrt[3]{EI}$ where E is the modulus of elasticity and I the moment of inertia. The results with this model were rather discouraging, the influence lines having remarkable tendencies to assume variations of a sinusoidal nature. This was finally ascribed to the variations in temperature and moisture during the interval between

(*Continued on following page*)

The new—

BOEING "247-D"

a plane greater even than the "247"



BOEING

Boeing has always built tomorrow's airplanes today!

(*Continued from preceding page*)

readings. Accordingly a new model was made of celluloid. A small portable jig saw with an auxiliary filing device was found ideal for the construction of this model. It had less tendency to bend or warp and consequently fewer roller bearings were needed, thereby reducing any friction which may have been encountered by the original cardboard model. Two intersecting perpendicular lines were scribed at every inch along the span of the model, one of them parallel to the direction of the applied load. One cross hair in the micrometer microscope was always aligned parallel to this line since the deflection is always measured in the direction of the assumed load. First the influence line for the reaction at the fuselage was found. This was accomplished by the use of the shear plugs at this point and the measurement of deflections at every inch along the span. Similarly the influence line for axial load in the spar was obtained. The influence line for axial load in the jury strut is found by cutting the strut and attaching a gauge to this strut and proceeding as before.

Comparison of Results

The results obtained with deformeter are compared with the theoretical solution in the following table.

Station	Deformeter	Theory
Vertical reaction—fuselage	371	365.6
Vertical reaction—lift strut	2430	2408.1
Tension in jury strut	23.8	26.3

Omitting the last item from consideration the greatest difference is only 1.2%. This difference is largely due to technique and with practice can be reduced to 1% or less. In another instance the variation between analysis of a ring by theory and deformeter was negligible.

A number of problems peculiar to airplane design suggest themselves as easily capable of exact analysis with the deformeter, such as complex bulkheads in monocoque design, beams with variable moments of inertia subjected to combined loads, and redundant structures. Since secondary stresses are also adapted to deformeter determination the wide range of analyses capable of solution make this mechanical means most useful.

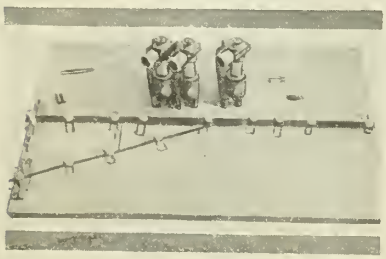


Figure 2. Typical setup showing two gauges, three micrometer microscopes and a model constructed of celluloid

PAINT AND THE AIRPLANE

(*Continued from page* 16)

finishes with a clear coating of fabric lacquer, somewhat similar to clear dope. This finish, however tends to crazing early, because a clear coating is not able to withstand the actinic rays of sun and weather as well as the pigmented finish.

Clear dope, followed first by an aluminum dope and then by a colored pigmented dope, rubbed and polished, makes a glossy, durable finish, much more durable, and many times more beautiful than the old type of finish. The ideal is a finish of great durability and good looks, requiring not more than two or three coats, every one of which add extra weight.

The Re-painting Problem

Re-painting a fabric surface has long been a problem with private owners. There is always the tangible threat of the Department of Commerce inspector, ready to condemn the ship whose finish and fabric are considered to have outlived their safe usage.

If the finish cracks or ringworms under stiff thumb pressure, or if it is dull, dry or chalky (with the fabric still tight) the old finish should be removed. But if the fabric on an old plane is too flabby, dope or varnish over the painted surface is a waste of time and money. The plane must be re-covered with new fabric and re-finished. There are numerous cases, however, where a new coat of dope has worked wonders on an old "dope" finish which still showed life. Frequently such a finish proves entirely satisfactory for several months, since the fabric is re-tautened and the appearance improved.

The practice of removing all paint and re-painting is becoming quite popular in small shops and with private owners. A wax-free paint and dope remover will uncover the original fabric which can then be re-finished and put in condition approximating newness. Done with care by an experienced man, the process is highly effective. Either in adding a coat of dope or paint, or in complete re-painting, the importance of clean surfaces should not be overlooked. Washing in gasoline and soap and water is advised, before applying new coats of finish.

Dope-proofing of metal parts which touch the fabric of a plane has been developed to a degree of perfection by the Army and Navy. Shellac and tinfoil are used and a type of cellophane tape has also proven satisfactory.

As to where this re-finishing work can and should be done, factory service men have their own ideas. Some believe that all paint jobs should be done in a factory, or at least in a large and well-equipped service depot. Others agree that proper care even in the small hangar will produce good results.

While the job is in progress, humidity and drafts are the two conditions which must be carefully watched. If the temperature is too low, an orange peel effect may develop. Drafts and wet weather cause a lacquer finish to "blush," but a more careful adjustment of the quick-evaporating solvents in a lacquer usually prevents this.

Methods of controlling the temperature and humidity of the paint shop are well-known and present only physical problems. Highly-developed spray guns, good air hoses, compressors and regulators on the physical side are always available. The individual hangar having these requirements and utilizing high quality materials can turn out as good a paint job as the factory.

In factories, the canopy-type exhaust system is becoming standard. Plenty of unrestricted floor space and walls of air under pressure are likewise very desirable. A non-sparking fiber reduces the fire hazard, and well-designed racks facilitate the aircraft painting problem.

Production Methods

Quantity production methods have been attempted in such factories as Chance Vought, Curtiss, Stinson, Consolidated, Boeing and Douglas. Dipping of small parts, ribs and sections of sheet metal into the primer, handled in racks; spraying the finish on these parts in large numbers, held by racks, rods or hooks; and the use of convenient racks for large pieces of work, such as wings, are some of the efforts speeding up the job. In larger items of work, time limits have been set, as for example, two men may be limited to three hours to apply two coats of dope by brush, and to apply the tape to one wing panel; another man has 90 minutes to mask and spray three coats of dope on a fuselage; and two other men are given three hours to sand the aluminum pigmented dope on a fuselage, etc. Metal construction under quantity production conditions will probably force a complete change in the physical appearance and management of the paint room.

It has been found that so simple a thing as a waxed surface on a racing plane, will boost its top speed as much as four miles an hour, and this margin often separates a pilot from important records. The glassy finish, prevalent in commercial planes, applied to the racer, and then waxed and polished, approaches the absolute minimum in surface drag. Waxing and polishing have shown little effect in increasing the speed of low-priced commercial planes of average speeds. Careful owners, however, protect their finishes by a regular polishing routine.

SKF EQUIPPED BUILT BY PRATT & WHITNEY AIRCRAFT CO.

CERTAIN "WASP" PERFORMANCE WITH SKF

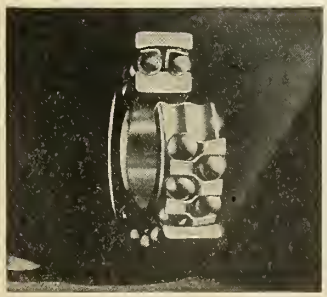
▼ ▼ ▼ DEPENDABILITY

THE *dependability* of a plane engine is measured by the performmance of its bearings and other equipment! And whether the craft is a one-seater or a Zeppelin there's no question of dependability when the bearings are SKF!

And it's true of Pratt & Whitney's 525 h. p. "Wasp" engine in this 1934 Bellanca "Senior Skyrocket"! For the ability to combine speed, load carrying capacity and dependability is characteristic not only of the "Wasp" engine and the Bellanca design but of SKF Bearings! This make of bearing was on the Spirit of St. Louis . . . the Columbia . . . the America . . . the Question Mark . . . the Macon . . . the Graf Zeppelin! The same make of bearing has been on every ship of the air that has written history across the skies . . . and selected solely upon the basis of PERFORMANCE, the only thing that counts in a bearing!

3293

● *You may buy a bearing as a bargain but try and get a bargain out of using it, for nothing is apt to cost so much as a bearing that cost so little*



SKF INDUSTRIES, INC., FRONT ST. and ERIE AVE., PHILADELPHIA, PA.

SKF

Ball and Roller Bearings

Quill Bearings for Aircraft

H. D. ALLEE, Manager, Automotive Division

Bantam Ball Bearing Company

● In computing the capacity of any bearing, many factors apart from the bearing elements affect its capacity and life. These may entail load distribution, distortion of supporting element, fit of bearings on shafts or in housings, amount of continuous service, alignment of supports, expansion and contraction due to temperature changes, percentage of load relative to bearing capacity, lubrication, amount of foreign matter in bearing, accuracy of bearing parts, shafts and housing dimensions, and type of service (intermittent or continuous smooth or shock load).

Any of the above factors or a combination of them, may result in a bearing able to carry only a small percentage of its rated capacity, while in some cases loads several times the rated capacity can be carried. Most of these factors can be (and are) controlled, but attention to detail is necessary for the efficient and continued satisfactory operation of any bearing.

Quill bearings, high carrying capacity, radial, anti-friction bearings, require only slightly more space than an ordinary bushing. They consist of an inner and outer raceway, a full complement of rollers and hardened side plates or lips. The inner raceway may be a separate part or it may be a shaft, while the outer raceway may be either a separate part, the housing proper or the bore of some cooperating part. The rollers are of small diameter in proportion to the shaft diameter and of long length with respect to roller diameter.

Carrying Capacity Formula

The carrying capacity of quill bearings depends upon the hardness of the bearing elements and the metallurgical details by which the hardness is secured. Bantam rollers have a hardness of from 56 to 60 Rockwell C, and the inner and outer raceways have a hardness of 60 or more.

The actual carrying capacity of the quill bearing as an assembly is obtained from formula I in which

R = Rated safe load in pounds.

S = Speed of rotating member. (r.p.m.)

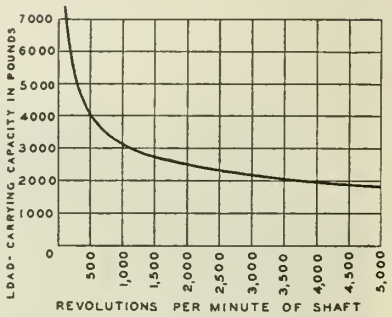


Fig. 1. Curve of rated load/speed

L = Effective length of one roller or row of rollers in inches (less chamfers, radii, etc.)

PD = Pitch diameter $D + d$

$$R = \frac{N \times L \times d \times 10{,}000}{\sqrt[3]{S}} \quad \ldots\ldots \text{(I)}$$

When the projected area is known, formula I can be evolved to

$$R = \frac{(D+d) \times L \times 31{,}416}{\sqrt[3]{S}} \quad \ldots\ldots \text{(II)}$$

and to eliminate calculation, figure I may be used. Values taken from this chart multiplied by the projected area of the pitch diameter of the bearing in square inches, equals the rated safe bearing load; projected area being PD × L. Where two or more rows of rollers are used, the area is the sum of all the effective roller lengths times PD.

Figure 2, based on the assumption that a reasonable roller size (See figure 3) be used for any given shaft diameter, (inasmuch as [D + d] in formula II consists of two variables) gives the load carrying capacity of one roller per inch of length. In using this chart the rated safe load of a bearing is:

$$R = N \times L \times F \quad \ldots\ldots\ldots\ldots \text{(III)}$$

where F is the factor for any given roller and given speed as taken from figure 2.

After obtaining the rated capacity above, multiply by the load factor, (figure 4) to obtain the actual capacity for the assembly in view of the hardness of the raceways to be used.

To obtain maximum life as well as maximum carrying capacity, the raceway hardness should be increased above 60 C Rockwell. An increase in capacity will not be obtained, but the wear on the raceway will be correspondingly reduced. A raceway hardness of 65 C Rockwell and a load of 50% of carrying capacity shown in figure I will give exceptional life.

To adapt small diameter rollers to a given design, it must be remembered that oscillating motion and pure rotation require different conditions and ratios of roller lengths, shape of ends and clearances.

For oscillating motion of small arcs of travel (30° or less either side of center) the roller can be of any diameter and the ratio of length to roller diameter anywhere between 3:1 and 10:1; the spherically ended-roller is preferable because of its superior operation and low cost. For oscillating motion where the swing is more than 30° either side of center, it should be considered as pure rotation. For calculating the load-carrying capacity under oscillation, a speed of 8 r.p.m. or a projected area factor of 15,000 lbs/sq. in. *maximum* is used.

Proportions of Rollers

Except for short rollers with relatively large diameters and guided by lips for pure rotation, the roller length with spherical end should not be less than .125 the shaft diameter. Ratios of from 1:1 to 1:2 shaft diameter are preferable. Where ratios outside these limits are required by virtue of space and where the load capacity is not required, chamfered end rollers can be used, but must be confined in a definite track with close tolerances on roller length and distances between end rings or lips.

The determination of the proper roller diameter is a function of roller speed and numbers of rollers for a full complement. Where possible the quantity should be kept under 60 rollers per row. Roller speeds theoretically greater than 60,000 r.p.m. should be avoided, although successful applications have exceeded these values. Theoretical roller speed is obtained from the ratio of the shaft diameter to the roller diameter multiplied by the shaft speed in r.p.m. From these two factors can be determined the best roller diameter to use.

Roller length to roller diameter ratios of from 6:1 to 10:1 have been found

R.P.M. OF SHAFT

Roller Diameter	50	100	200	300	400	500	800	1000	1500	2000	2500	3000	3500	4000	5000
1/16"	170	135	108	93.3	84.8	78.6	67.5	62.2	54.6	49.6	46.0	43.4	41.2	39.4	36.6
3/32"	254	202	180	139	127	118	101	93.3	81.8	74.8	69.0	64.8	61.6	59.0	54.7
1/8"	339	269	213	186	170	157	135	125	109	99.5	92.4	86.8	82.3	78.7	72.9
3/16"	468	403	320	280	254	236	201	187	164	148	138	130	123	118	109
7/32"	593	471	373	327	296	275	235	218	191	173	160	151	144	137	128
1/4"	878	537	426	373	339	314	268	250	218	198	184	173	164	157	148

Figure 2. Load-carrying capacities (in lbs.) for varying shaft speeds

DIAMETER	LENGTH	DIAMETER	LENGTH
.0623	.375	.2498	1.235
.0627	.395	.2500	1.250
.0623	.646	.2498	1.740
.0627	.666	.2502	1.750
.0935	.479	.3123	2.480
.0939	.489	.2125	2.500
.0936	.955	.3748	3.230
.0939	.975	.3750	3.250
.1248	.730	.4998	4.480
.1250	.750	.5000	4.500
.1580	1.000	.7498	6.480
.1582	1.015	.7500	6.500
.2180	.735	.9998	8.980
.2182	.755	1.0000	9.000
.1873	.990		
.1875	1.000		

Fig. 3. Dimensions of rollers

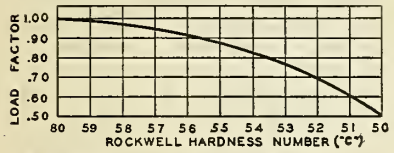


Fig. 4. Curve of hardness/load factor

highly desirable for rotative motion, and other factors being practical, attempts should be made to arrive at sizes falling within this range.

Figure 5 shows the types of ends used on quill type rollers and the effective lengths to be used in calculating the carrying capacity. The spherical end is preferable and any deviation from this involves additional cost and in some cases unsatisfactory performance. Conical trunnion ends are used only to permit retainment prior to final assembly and use of these retainers complicates the design.

The following data shows how to determine approximately the proper number of quill rollers and clearances. Referring to figure 6, the various symbols, and their measurements in inches, used in formula IV are defined:

N = Number of rollers for a full complement bearings.
d = Diameter of rollers (high limit of actual size).
D = Diameter of shaft or OD of inner raceway.
K = Constant (Figure 7).
CC = Circumferential clearance on pitch diameter.
PD = Pitch diameter of pitch circle of rollers (including circumferential clearance).
dc = Diametral clearance.
B = Bore or ID of outer raceway.

$$N \text{ (approx.)} = \frac{(D \text{ approx.} + d) \times 3.1416}{d} \quad \text{(IV)}$$

Having the approximate number of rollers N, the value of K for this number of rollers is obtained from figure 7 and this value is substituted in formula V.

The CC varies from an absolute minimum of .0001 per roller to more than one roller diameter. For oscillating motion, the CC can be kept toward the minimum, but for rotation it must be increased with the number of rollers, ½ roller diameter for 20 rollers and 9/10 roller diameter for 50 rollers. The omission of one or more rollers from a full complement does not affect satisfactory performance of the bearing.

For oscillating motion and under some rotative conditions it is possible to have the rollers keystone in the outer raceway. Thus when the shaft or inner raceway is removed, the rollers drop by gravity and form their own arch (formula VII). This feature is a combination of CC roller diameter, dc and outer raceway bore diameter.

The formula for keystone is

$$X - d + CC < d, \text{ where}$$

$$X = PD \times \sin \frac{360^\circ}{N} \quad \text{.....(VII)}$$

Having determined the proper CC, the actual pitch diameter is obtained from

$$PD = K \times d + \frac{CC}{3.1416} \quad \text{.....(V)}$$

To obtain the shaft or inner raceway diameter

$$D = PD - d \quad \text{.....(VI)}$$

This gives the maximum shaft or inner raceway diameter and the tolerance used in manufacturing (usually .0005) should be subtracted from it to obtain the low limit D.

No. Rollers	Value K	No. Rollers	Value K
10	3.236036	51	18.243850
11	3.549509	52	18.581564
12	3.863689	53	16.879250
13	4.178586	54	17.199862
14	4.493978	55	17.517599
15	4.809773	56	17.835304
16	5.125839	57	18.152981
17	5.442316	58	18.470632
18	5.758710	59	18.788252
19	6.075626	80	19.105846
20	6.392835	61	19.427555
21	6.709479	62	19.744845
22	7.026733	63	20.062479
23	7.344090	64	20.380089
24	7.661074	65	20.697869
25	7.978935	66	21.015224
26	8.296583	67	21.336424
27	8.614006	68	21.654949
28	8.931192	69	21.972565
29	9.248982	70	22.290153
30	9.566632	71	22.607719
31	9.884511	72	22.925264
32	10.202520	73	23.242782
33	10.519702	74	23.560273
34	10.838034	75	23.883449
35	11.156268	76	24.201045
36	11.474469	77	24.518626
37	11.791250	78	24.836174
38	12.109316	79	25.153708
39	12.427348	80	25.471218
40	12.745348	81	25.788702
41	13.064441	82	26.106171
42	13.381251	83	26.423612
43	13.699154	84	26.748188
44	14.017024	85	27.065753
45	14.334862	86	27.383306
46	14.660235	87	27.700831
47	14.972682	88	28.018339
48	15.290520	89	28.335836
49	15.608326	90	28.653295
50	15.926103		

Fig. 7. Values of "K"

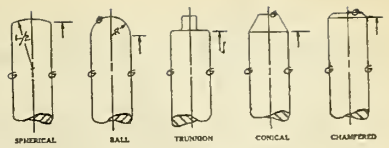


Fig. 5. Types of ends on quill-type rollers

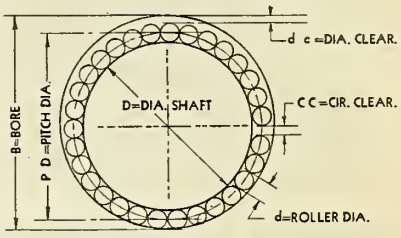


Fig. 6. Symbols for bearing calculations

The proper diametral clearance dc is of vital importance to the proper functioning of the complete bearing.

On shafts up to 2", the value of dc should be held from .0005" to .0015" (this does not include tolerance of the rollers, but includes the tolerance of the inner and outer raceways). In calculating, the high limit of the roller should be used.

The length of the raceways to accommodate the rollers should be nominal size +.015" to +.025", thus giving minimum endwise clearance of .015". Recommended tolerance on roller length is nominal size —.015".

For volume assembly in production, sub-assembly of rollers can be made in stockrooms and transferred to final assembly in sleeves or on dummy shafts. Grease, lacquer or paraffin can be sprayed on the sub-assembly when severe handling conditions are encountered.

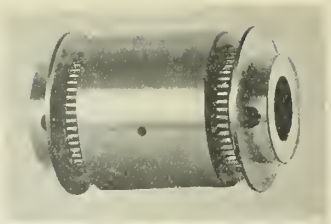
The retaining rings for end-wise movement of the rollers may be of several types, such as hardened and ground shoulders on the raceways, hardened and ground loose rings on the inner or outer raceway, rings pressed on the inner raceway or into the outer raceway, or they may be snap rings in grooves. Whatever method is used, the end retainment should be a hardened and ground surface.

In the case of split snap rings, the split should not exceed 20% of roller diameter and should have commercially square edges without burrs. Grinding or polishing after splitting is necessary. Round wire rings have been used but flat rings are desirable. The diametral clearance of end retainers over the raceways should be .010" minimum, but in all cases must be less than .25 of the roller diameter. Satisfactory hardened spring steel snap rings for this service have been developed.

Any lubrication applicable to antifriction bearings is in general satisfac-

tory. Where heavy lubricants are used the minimum values of *CC* should be avoided, but excessive clearances for lubrication are not necessary. In some installations, indications are that lubricant used in the original installation might be sufficient for the life of the machine.

These quill bearings have the maximum carrying capacity possible for any given space and most of the 70 different styles and sizes of quill bearings produced are made to fit specific requirements since the bearing is directly adaptable to locations in which an anti-friction bearing cannot be installed, or as a replacement for a bushing or plain bearing which will not carry its imposed load. These quill bearings are used mainly as loose rollers because in this manner they attain the maximum carrying capacity and occupy minimum space in the assembly in which they are used.



One of the quill bearings used in control mechanism of the Vultee low-wing, single-engine transport

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Pterodactyl Tests

Spinning of Pterodactyl Mark IV. Part I. Model Tests, A. V. Stephens and J. Cohen. Part II. Full Scale Tests, A. V. Stephens (British) Aeronautical Research Committee — Reports and Memoranda — No. 1576 (*Spin.* 107, 138), *February,* 1933 (*published July* 6, 1934), 10 *pp.,* 2 *figs.*

SPINNING CHARACTERISTICS were investigated for a dynamical model of the Pterodactyl airplane which is controlled by large flaps on the wing tip functioning as elevators when moved together and as ailerons when operated differentially. Wind-tunnel results indicated that recovery from spins could be rapidly effected by means of the controlling flaps alone, but a very considerable force on the control column would be necessary. For full-scale tests the area of the rudders on the wing tips, which had been found ineffective, was doubled and two devices provided for assisting the pilot to move the stick forward. The most interesting result of the full-scale test was the spiral motion which was obtained with both controlling flaps fully up.

Experiments on the Westland-Hill Pterodactyl, Mark IV. Part I. Experiments on a 1/5 Scale Model, A. S. Batson. Part II. Full Scale Tests, J. E. Serby. (British) Aeronautical Research Committee—Reports and Memoranda No. 1577, *January* 5, 1931 (*published August* 2, 1934), 19 *pp.,* 21 *figs.*

THE OBJECT of these experiments was to compare results of a one-fifth-scale model with those previously obtained with a one-sixteenth-scale model and to coordinate them with full-scale test results. Effects of rudders of two different sizes fitted to the wing tips and of various modifications were determined. The design from a performance point of view was good, the very low minimum drag achieved by its clean body and undercarriage lines giving good top speed and climb although the stalling speed was high, due to its poor maximum lift coefficient. General stability and control were fairly good, although the anticipated lateral stability at stall had not been realized. The worst feature was the bad take-off involving a run of 250 yards.

Aluminum Blistering

The Blister Formation in the Heat Treatment of Refined Aluminum Alloys (Die Blasenbildung bei der Waermebehandlung verguetbarer Aluminiumlegierungen), W. *Gatzek. Luftfahrtforschung, Vol.* 11, *No.* 3, *August* 18, 1934, *pp.* 65-73, 24 *figs. Bibliography.*

IN THE 1200 heat tests undertaken for this report, it was found that with those in Argon, where no outside effects were possible, blistering of the aluminum did not occur, nor did it in the case of salt baths after the sheet had previously been annealed in high vacuum. The author attributes blistering primarily to the free hydrogen contained in the aluminum and to small impurities. He points out that at the higher temperatures for the hydrogen and metallic compounds there is built up a gaseous compound on the surface of the sheet if the speed of formation is sufficient. He considers this speed important to blistering, assuming that in high vacuum, the dissipation speed of the hydrogen must be essentially greater than the formation speed of the metallic-hydrogen combination. He believes that, as far as possible, the absorption of hydrogen should be eliminated in the production from the raw material and in casting by doing away with moisture or steam in the furnaces, and recommends that the heat treatment take place in an electric furnace.

Report of the Deutsche Versuchsanstalt fuer Luftfahrt.

Duralumin in Shear

Behavior of Light Sheet Metal Strips with Circular Flange-Edged Holes under Shearing Stress (Ueber das Verhalten von Leichtmetallblechstreifen mit kreisrunden randgeboerdelten Loechern bei Schubbeanspruchung). Luftfahrtforschung, Vol. 11, *No.* 3, *August* 18, 1934, *pp.* 74-85, 20 *figs.*

THE EFFECT of circular flange-edged holes in duralumin sheet strips subjected to a shearing stress was investigated for this report. Questions are discussed with regard to the load in shear at which the sheet will break, the form which the sheet must retain to resist as high as possible a shearing load, and the amount of displacement in the slope from the load below the point of rupture. For each sheet width, thickness and form of flanging, an efficient hole spacing and the corresponding breaking load in shear are given. Comparison with the unflanged sheets indicates that the breaking load as well as the displacement increased with flanging. For thin wide sheets, due to the strengthening effect of the flanging, the breaking load was even greater than in solid sheets.

Catapults

Operation of the Catapult (L'impiego delle catapulte), G. A. C. Gustosa. Rivista Aeronautica, Vol. 10, *No.* 7, *July,* 1934, *pp.* 49-84, 21 *figs.*

CATAPULTS FOR the take-off of either land or seaplanes from the decks of ships and from landing fields are described. The author makes a chronological survey of the development and refers to modern types of catapults using compressed air. He takes up the facilities for projecting such a weight as an airplane and derives the velocity of projection, length of the runways, value of the acceleration during projection, force of inertia produced in some parts of the air, strength of the equipment for this particular pressure, and the incidence of the wing necessary in order to insure its stability in the air.

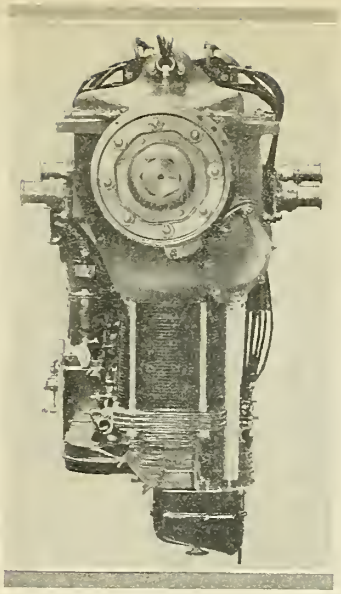
Altitude Measurements

The Evaluation and Control of Altitudes in regard to Altitude Records (Evaluation et contrôle des altitudes en vue des records), P. Berger. L'Aéronautique (L'Aérotechnique supplement), Vol. 16, *No.* 183, *August,* 1934, *pp.* 65-69, 1 *fig.*

THE METHOD employed by the F.A.I. since 1920 for evaluating altitude records is discussed and research undertaken to find a better method is described. The author believes that altitude determined with the aid of the specific gravity of the air at the highest point of the trajectory gives as good results as that obtained by the F.A.I. method and recommends that, where density of the air is the criterion, the barometric formula be used in place of standard atmosphere for calculating sport records.

(*Continued on page* 37)

The deHavilland Gipsy-Six Engine



● Following the successful termination of its official Air Ministry tests, the new de Havilland Gipsy-Six has been placed into quantity production at the deHavilland Aircraft Company's plant, Edgware, Middlesex, England. Tests have revealed that with the engine operating at 2350 r.p.m. a maximum output of 205 b.h.p. is obtainable, while at 2100 r.p.m. (the normal speed) a horsepower output of 184 is available.

The new engine is similar to the 130 h.p. Gipsy Major, except that it has six cylinders instead of four. Like its counterpart, it is an air-cooled, inverted, in-line engine with many of its component parts interchangeable with the Major, particularly cylinders, valves, valve gears, pistons, rings, gudgeon pins, connecting rods and big ends. With a total weight of 432 pounds (including the propeller boss, fuel pumps and cowling, but minus starter or generator) the Gipsy-Six, at its maximum performance, has a weight of 2.11 lbs. per h.p.

Alternative air inlets prevent freezing at cruising speeds and yet allow ingress of air to the engine at the relatively low temperaturees needed to secure highest efficiency at full throttle. With the throttle in the cruising position the cold air inlet is closed and warm air enters, through a flame-trap, from the vicinity of the crankcase. This gives smoothness and economy in running. Maximum output, however, would be impaired by the resistance of a flame-trap and high induction temperature; when the throttle is fully open, therefore, a valve cuts off communication between the flame trap and the carburetor and at the same time opens a duct communicating with the slipstream through an ordinary air intake.

Provision is made on the rear wall of the crankcase for attachment of a six-volt electrical starting unit. The closing of a contact in the cockpit engages the starter unit with a dog on the rear end of the crankshaft, and an electric motor rotates the engine through gearing at a speed sufficient to insure quick starting under all conditions. As soon as the engine fires, the dog coupling automatically disengages. An electrically-operated inertia starter may be fitted if preferred.

The six-throw crankshaft rotates in eight steel-backed main bearings. Its center line is located some distance below the joint for the top cover, providing a deep stiff crankcase. All auxiliaries as well as the camshaft are driven from a gear wheel mounted on the front end of the crankshaft immediately behind the propeller thrust bearing. This is the steadiest point in the propeller-crankshaft system and provides the smoothest drive for the accessories.

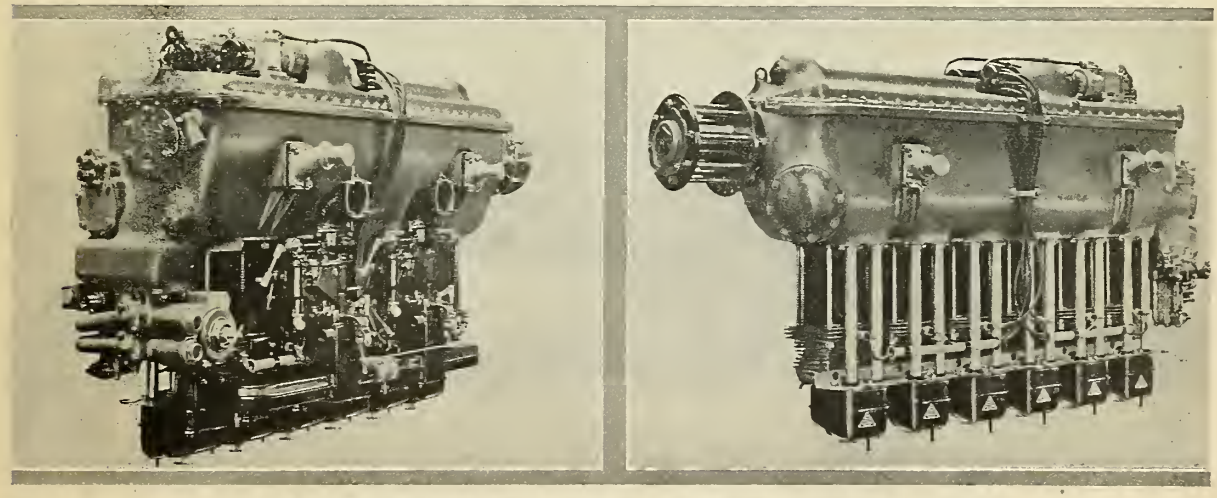
Dual ignition is provided by two six-cylinder magnetos mounted with their separate distributors on the crankcase top cover. The arrangement is compact and accessible. The magnetos with distributors are advanced and retarded in unison by a single automatic timing device in the driving shaft. To facilitate starting, an impulse starter is fitted to each magneto. Two fuel pumps, either of which is capable of supplying fuel to the carburetors in excess of the maximum engine requirements, are fitted to the engine.

A gear-type pressure pump supplies oil at 40-44 lbs./sq. in., to the engine through a filter. Except for the pipe lines to and from the oil tank, there is no external pipe-work on the engine. Two scavenge pumps are arranged to drain the engine of any surplus oil whatever the condition of flight. The suction sides of the scavenge pumps are protected by gauze filters.

Four "Gipsy-Six" engines provide power in the new D. H. 86 transport biplane which has been built to the order of Imperial Airways. One of the engines has also been installed in a "Leopard Moth" light cabin monoplane, with notable results in increased speed.

Specifications

Bore	4.646 inches
Stroke	5.512 inches
Displacement	560.6 cubic inches
Normal output (2100 r.p.m.)	184 b.h.p.
Maximum output (2350 r.p.m.)	205 b.h.p.
Compression ratio	5.25:1
Fuel consumption at 2350 r.p.m.	15 gal./hr.



The deHavilland Gipsy-Six inverted engine which delivers 205 h.p. at 2350 r.p.m.

The deHavilland "Comet" MacRobertson Racer

● The twin-engined deHavilland *Comet*, which took C. W. A. Scott and T. Campbell Black of England from Sussex, England to Melbourne, Australia in 71 hours to win the MacRobertson Race differs from anything previously built by the de-Havilland Aircraft Co., Ltd. Three planes of this type were specially designed and specifically constructed for the long race. The other two were flown by James and Amy Mollison and by Cathcart Jones and Kenneth Waller.

Essentially, the *Comet* is a low-wing cantilever monoplane constructed entirely of wood, with a retractable landing gear, wing flaps, and two Special Gipsy Six engines, with controllable pitch propellers.

Stressed skin construction has been used extensively because spars of a depth which could be housed in the thin wing-section used, would not have provided sufficient strength. To obtain the necessary strength the wing covering was disposed so as to reinforce the spars and the system finally adopted was one in which some of the members, having the appearance of orthodox wing spars and of box-section construction are used for taking the shear loads and for transmitting the loads to the covering. Bending and torsional loads are taken by the skin which is in the form of a spruce planking laid on similar to the "double-diagonal" planking used in boats. There is an inner and an outer layer, each composed of spruce strips which cross each other at approximately right angles. Where stresses are high the thickness of the skin is reinforced by a third and sometimes a fourth layer. In some places the layers reach a thickness of more than half an inch, while at other places, where the loads are small, the planking is only about ⅛" thick. The wing is built-up of wood ribs, longitudinal stringers and three box spars.

Somewhat similar construction has been adopted for the clean streamline-shaped, wood monocoque fuselage with four longerons and a built-up transverse bulkheads. The top and bottom of the fuselage have a double curvature, and are planked with spruce strips similarly to the wing, while the nose and tail fairings are of sheet Electron. Its maximum cross-sectional area has been kept to a minimum which would house the crew, and the cockpit is placed well aft, increasing the fuselage depth slightly behind the cockpit and using a sloping windshield. The cantilever stabilizer is built-up of wood sections which pass through the fuselage while the wood fin is bolted to the sternpost and bulkhead immediately in front.

Sheet metal fillets are used at the junction of the wing and fuselage and on the tail where they are used to fair the fin surface into the fuselage and stabilizer surface. The rudder extends down to the top of the fuselage. To reduce skin friction, wings and fuselage have been treated with several coats of paint, each being rubbed down between applications.

Cockpit and Control Surfaces

The cockpit, with a transparent roof has accommodations for two people in tandem, with a stick control for each. The instrument panel is visible to both pilots. A wheel to the right of the front seat operates the landing gear and on the left is the lever for the flaps. Wheel brakes are connected to the rudder bar.

Control surfaces are of the usual form, with a type of Frise aileron operated by the deHavilland differential method. Ailerons are mass-balanced by lead distributed along the leading edge of the aileron, and servo-control mechanism is used for control of the horn-and mass-balanced rudder and elevators, the latter also being provided with a spring-loaded trimming device.

The retractable landing gear wheels are drawn up and housed in the engine nacelles each of which has in its aft end an oil tank for almost 7 gallons of oil. Mudguards not only prevent stones and other foreign particles from flying into the propellers, but also form a streamlined bottom part of the nacelles when the wheels are retracted. The landing gear has a tread of 9 feet 8 inches.

The flaps are of the split trailing edge type installed under the central trailing edge portion of the wing and extending from one nacelle to the other. They are operated by torque tube and levers, and when closed, fit snugly against the main wing surface.

Three fuel tanks are provided, all housed in the fuselage. The nose section carries one of 128-Imperial gallons capacity; another of 110-Imperial gallons capacity is forward of the cockpit while the third of 20-Imperial gallons capacity, aft of the cockpit, is also used for trimming purposes. As fuel is consumed, the forward tank begins to empty, and to keep the machine from being tail-heavy a small quantity is taken from the rear tank, which is further from the c. g.

Engine mountings and undercarriage attachments are the only metal structural parts in the plane. Welded steel tube construction is used for the former and the undercarriage wheels are carried on steel forks with telescopic members.

The deHavilland engines are of the six-cylinder-in-line, inverted, air-cooled, direct drive type, especially modified from the standard Gipsy Six which has a maximum output of 205 h.p., at 2350 r.p.m. and a normal output of 184 h.p. at 2100

One of the three deHavilland "Comet" racers flown in the MacRobertson Race last month *Wide World Photo*

r.p.m. Alterations made specifically for the race have given increased power output, decreased fuel consumption and reduced drag. In their modified form the engines develop, on the bench, a maximum of 224 h.p., at 2400 r.p.m. at sea level, while at 10,000 feet, maximum output is 160 h.p., at 2250 r.p.m. with fuel consumption at 0.48 lb./h.p./hr. Compression ratio has been increased from the standard figure of 5.25:1 to 6.5:1. To take advantage of the controllable pitch propeller which was used, the normal engine-speed was increased to 2350 r.p.m. Use of this type of propeller has necessitated a new crankshaft with an appropriate hub fixing at the front end and the provision of a temporary oil supply at a pressure of 100 lbs./sq. in., to actuate the blades, this supply being obtained from the usual engine pumps through duplicate oil relief valves. A coupling is provided at the rear of the crankshaft for driving a rotary vacuum pump to operate the Sperry directional giro. By modifying the valve rocker gear and its casings, the overall height of the engine has been reduced and the shape of the cowling improved, while the alteration of the induction manifolds and the use of a smaller scoop for the cooling air, has decreased the overall width of the engine. The standard arrangement of the alternative hot or cold air supply for the carburetors is retained, and warm air (if required) is taken through the flame trap from the vicinity of the cylinders.

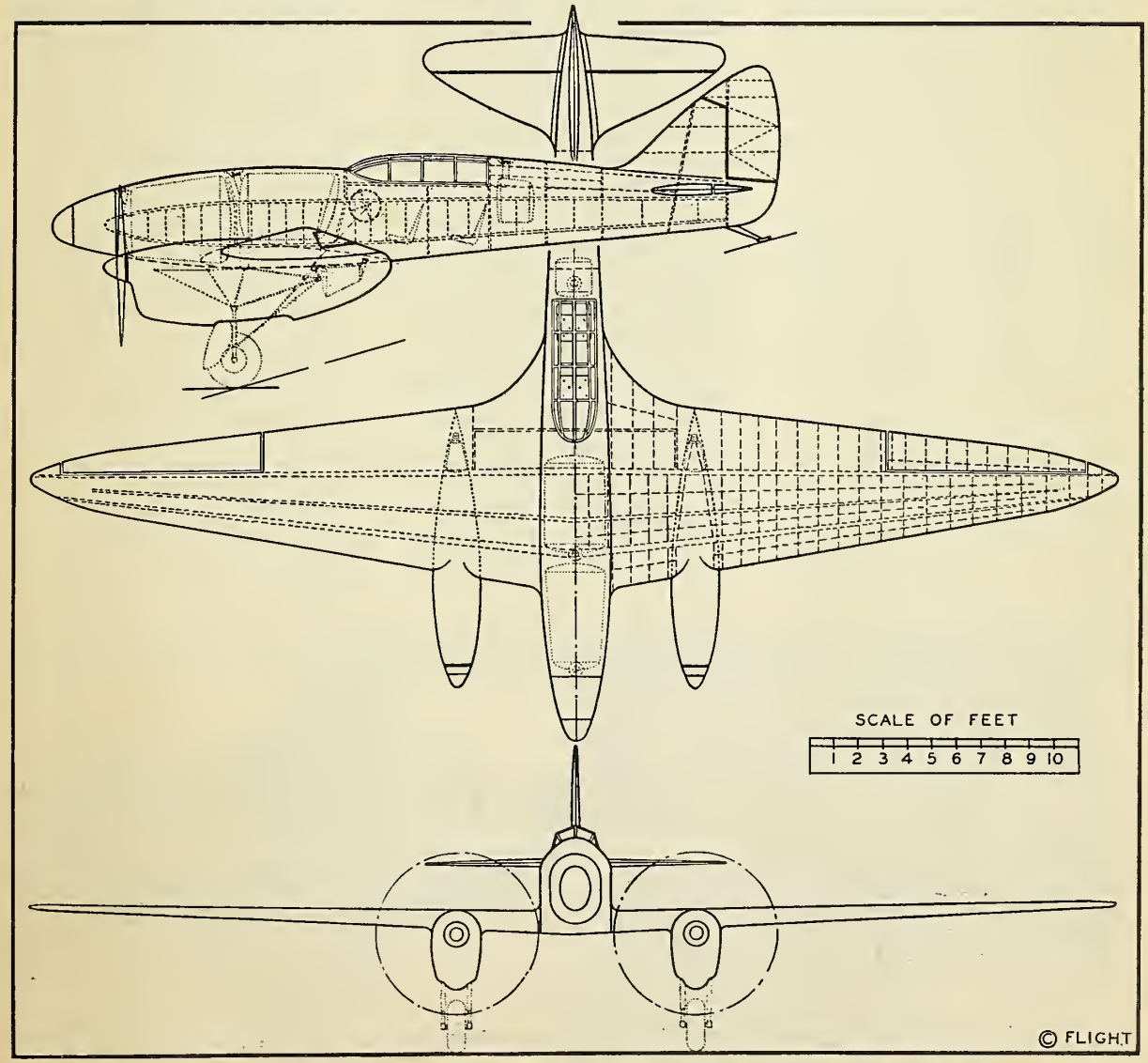
While complete performance figures are not yet available, flight tests showed that the *Comet* attained a speed of 235 miles per hour at an altitude of 1,000 feet and made 225 miles per hour at 10,000 feet.

Specifications of the deHavilland "Comet"

Wing span	44 feet
Empennage span	12 feet 7 inches
Overall height	9 feet 3 inches
Overall length	29 feet
Wing loading	24.7 lbs./sq. ft.
Power loading	11.8 lbs./h.p.
Fuel capacity (Imp. gallons)	258 gallons
Oil capacity (Imp. gallons)	13.8 gallons
Gross weight	5250 pounds
Top speed (1,000 feet)	235 m.p.h.
Top Speed (10,000 feet)	225 m.p.h.
Range	2700 miles

Areas (Square Feet)

Wing area	212.5
Ailerons	24.2
Stabilizer	11.3
Elevators	14.6
Fin	7.3
Rudder	9.6



Three-view outline scale drawings of the deHavilland "Comet," winner of the air race from London to Melbourne

Eclipse Automatic Variable Pitch Propeller Hub

● With the advent of the controllable pitch propeller, performance in take-off, climb and cruising and top speeds were improved considerably because of the attainment of the maximum performance from the engine when it was most needed. Control of the pitch of the propeller was likened to gear shifting in automobiles and its action was by comparison the same. Further refinement and engineering advancements have brought the controllable pitch propeller to a high degree of efficiency so that the introduction of an automatic variable pitch propeller hub is a further indication of the advancement of the project and a step in aiding and fostering the airplane as a means of transportation for the private flier.

Faced with the basic problem of automatically altering the blade pitch to effect fulfillment of the varied requirements of all flying conditions, without external means of control, the engineers of the Eclipse Aviation Corp., of East Orange, N. J., finally evolved the Eclipse Automatic Variable Pitch Propeller Hub, upon which approved type certificate No. 456 has been granted by the Bureau of Air Commerce.

In the analysis of the problem in the preparation of the original design, several variable quantities were involved. These included input horsepower, air density, air speed and engine r.p.m., each bearing a relation to one another and combined, equalling propeller thrust or drawbar pull. Therefore, with the desired result being the maximum drawbar pull or thrust for a given set of conditions, it became evident that the fulfillment of these requirements necessitated the development of a hub which would be so thrust-actuated that the most efficient blade pitches would be obtained for all flight maneuvers.

The general values of thrust are that it is greatest at full engine throttle when the air speed is lowest. Hence, when the engine is operating at full throttle, with the airplane stationary on chocks at zero speed, the maximum (or static) thrust is obtainable. Static thrust increases if the r.p.m. of the engine is advanced by the reduction of the pitch of the propeller blades. Therefore, with a hub in which the mechanism is thrust-actuated, the blade pitch is reduced at low speeds and the engine r.p.m. is increased to the maximum obtainable, resulting in shorter distance for take-offs and greater initial acceleration. Flight tests of the Eclipse hub have revealed an increase of 350 r.p.m. in the engine during the take-off compared with a fixed type propeller, and a decrease (in most cases) of 30% in take-off distance. Furthermore, the initial rate of climb has been found to be from 25% to 35% greater than could be obtained with a fixed pitch propeller.

As the air speed increases following take-off, thrust decreases, even though the propulsion efficiency becomes greater. Thus, as the air speed increases, the reduction of the thrust from the initial static thrust condition causes the blade pitch to become greater, meeting the condition of increased air speed without excessive engine r.p.m.

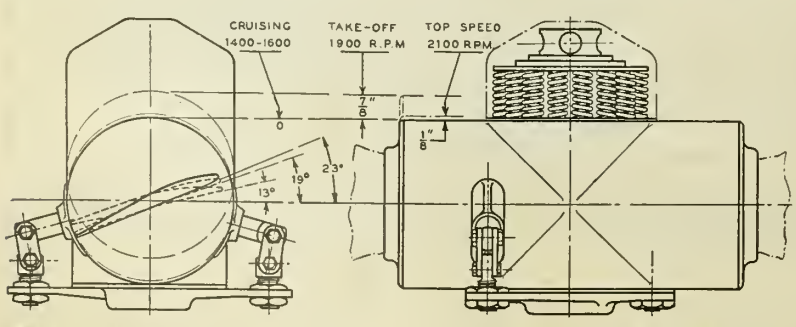
When cruising, thrust is diminished because of the reduction of input horsepower due to the throttling down of the engine, and in the efficient fulfillment of this condition of flight, the hub mechanism increases the blade pitch as the thrust is reduced thus diminishing fuel consumption in the cruising attitude. However, the blade pitch increase is greater than the air speed indicates, because the most satisfactory blade pitch angle for minimum fuel consumption for a given throttle setting is higher than for full throttle level flight at high air speed.

The maximum speed of the aircraft when utilizing the automatic variable pitch hub is not effected, because it primarily is a product of horsepower, provided the propeller tip speed is below the speed of sound and that the correct propeller diameter is used with engine r.p.m. in accordance with rated r.p.m.

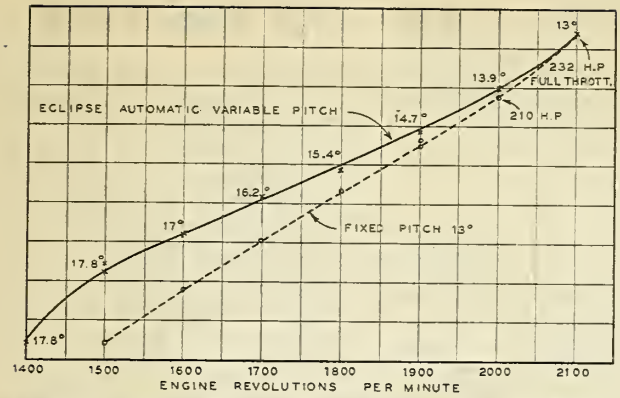
The Eclipse hub employs only three principal moving parts—the hub and two blades. A linkage system is connected to an anchored back plate acting as a fixed fulcrum and serving to vary the blade pitch as the hub and blades move forward against a group of springs within the hub cap. Thus, high thrust puts a load on the springs, compressing them and causes a low blade pitch; as the thrust decreases, the load on the springs also decreases and the springs move the hub backward, increasing the pitch. A further reduction in thrust (as occurs in cruising) causes a still greater advancement in blade pitch. The correct slope or rate of change of pitch necessary to fulfill all flight maneuvers has been solved in the initial design of the linkage and springs, but in this connection it is important to note that the hub is adjustable so that it can be employed over a wide range of air speeds and with different engines.

The hub, which is interchangeable with conventional fixed pitch hubs, and the blades are installed in the same manner as fixed pitch propellers and it is complete within itself, requiring no external control connections. The standard cones and locking nuts can be utilized to fasten the propeller on the splined engine shaft. A further feature is the elimination of control-actuating mechanisms for the propeller in the pilot's cockpit. At the present time the hub is available for installation on the SAE No. 20 propeller shaft for engines up to 250 horsepower.

Being automatic, the Eclipse hub assures the selection of the most efficient pitch setting under all operating condi-



Diagrammatic sketch showing principle of operation of Eclipse automatic variable pitch propeller hub, and position of hub relative to original position in various flying conditions which compress the coil springs the distances indicated



Graph of flight performances of a plane equipped with an Eclipse propeller hub compared with a fixed pitch propeller

tions, and allows the pilot's attention to center upon other duties without giving consideration to the performance of the propeller. In military work this feature is advantageous, as it allows the pilot to concentrate on maneuvering his craft and operating the armament. Whether in a dive, roll, climb or straight-away flight, the military pilot using an automatic variable pitch hub is assured that the blade pitch is adjusted to the conditions as it finds them, providing the most efficient performance throughout the flight.

There are an unlimited number of pitch combinations, engine r.p.m., air speed and input horsepower for various conditions of flight, so that even for a given cruising condition, the pilot has many variables to consider in selecting the most satisfactory setting. In view of the different combinations obtainable, the pilot cannot be expected to know what the pitch should be in order that the air speed be highest, consistent with the best fuel consumption for a given throttle opening and altitude. The automatic feature of the Eclipse hub eliminates the necessity of relying upon human judgment and practically assures the best performance under every operating condition.

A radial direct drive engine rated at 210 h.p. at 2,000 r.p.m., was used early this year for testing purposes. On the ground and equipped with a fixed propeller, the engine had a maximum r.p.m. of 1,780, the plane being held by chocks. In a comparable test, but using the automatic hub, the engine turned over at a maximum of 1,965 r.p.m.

With the fixed propeller, a full-throttle engine r.p.m. of 1,825 was obtained at the moment the plane left the ground after being held by brakes and then suddenly released. Under the same circumstances, but without the assistance of brakes, the engine turned up at 1,835 r.p.m. Similar tests with the Eclipse hub revealed in the first case an r.p.m. of 2,100 and in the second case a r.p.m. of 1,975. In all tests with the Eclipse hub, the initial pitch of the blades was set at 17.8° at a 42″ radius. The accompanying diagram graphically illustrates the increased performance obtained with the new hub in comparative tests with a propeller of the fixed—pitch type.

Digest of Foreign Technical Articles

(*Continued from page 32*)

Airplane Design

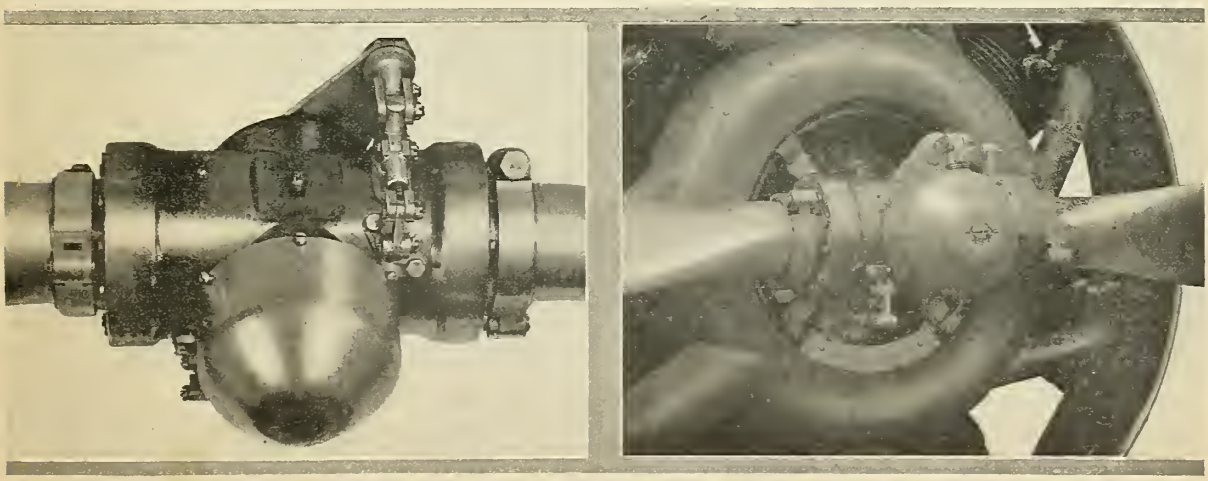
Principles of the Airplane (Elementi del velivolo), A. Fiore. Dr. Giovanni Bardi, Editor, Tipografia del Senato, Rome 1934-*XII,* 209 *pp.,* 380 *figs.*

A TECHNICAL description of various types of airplanes and parts is given and is evidently intended for those with engineering training who would like to know something about the airplane. The author does not refer to the theory of flight but described wood and metal construction for the wings and fuselage, operation of the control surfaces, and the foreign and American shock absorbers, wheels and brakes in use. The largest part of the book deals with the engine-propeller group. Although saying nothing about the engines themselves, the author outlines methods of constructing and checking metal and wood propellers, devotes considerable space to the installation of accessories, fuel and oil lines, tanks, and fire extinguishers and takes up the design of different types of fuel pumps, radiators, and starters.

Landing and Take-off Speeds

Landing and Take-Off Speeds of Aeroplanes, R. S. Capon. (British) Aeronautical Research Committee—Reports and Memoranda No. 1594, *January* 19, 1934 (*published September* 14, 1934), 7 *pp.,* 3 *figs.*

THE EFFECT on the landing speed in relation to the height at which the airplane is stalled is considered and the possibility of taking off at speeds below the stalling speed is discussed. It is shown that if the whole weight of the airplane is borne by the undercarriage just prior to the pull-off, the take-off speed may be 13.5 per cent below the stalling speed (engine-on) or 8.5 per cent below when half the weight of the plane is airborne prior to the take-off.



Details of Eclipse automatic variable pitch propeller hub and its installation on a direct drive 210 h.p. engine

Aircraft Wheel And Engine Tool

• AIR TRANSPORT Equipment, Inc., Roosevelt Field, Mineola, New York, has developed a new-type wheel which mounts size 950-12 and 1100-12 semi low-pressure tires. This wheel, called the Sem-lo, fits Bendix brake mechanism and a 2-3/16" axle, without change or adapters. According to Alex A. Pedu, president, it is equipped with a new-type graphited oil-less bearing and is stressed to take an airplane up to 3 tons weight.

The company is also manufacturing a new-type valve and spring depressor for Wasp and Hornet engines. The device was designed by Fred Powell and is convenient to field mechanics in removing the push rods of these engines.

Radio Compass For Pilots

• A LONG-RANGE radio compass which its manufacturers claim enables itinerant pilots to find their way directly to any radio broadcast station has been developed by Westport Manufacturing Co., Glendale, Calif.

Called the automatic radio compass, the first unit for civil use was built for the Lockheed Vega being equipped by the American Lithuanian Trans-Atlantic Flight Association for a flight by Felix Waitkus from New York to Lithuania.

The installation consists of an indicating dial mounted in the cockpit, a conventional Westport aircraft radio receiver, a compass converter, a dynamotor, and a loop antenna mounted in the fuselage. The complete assembly including cables, weighs less than 45 pounds and the receiver and converter units measure 12 × 7¾ × 11½ in., overall.

When within range, a pilot tunes in on a broadcast station by listening through the earphones in the customary manner. If the plane is headed directly toward a station, the indicator needle on the dial points to "zero." If the plane is off course, the needle points right or left as the case may be.

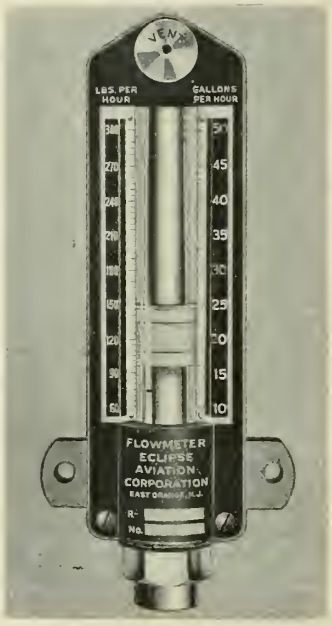
In addition to enabling the pilot to fly directly to a radio station, the radio compass gives a navigator the information he needs to locate his exact position. To do this, he tunes in several different stations, finds their direction, and by a system of triangulation determines the location of the plane.

If the pilot desires, he may listen to the entertainment broadcast while he is using the station as an aid to navigation. If the plane is headed directly toward a station, the program is loud and clear. If the plane is off course, a buzzing note comes through the earphones as a warning and the indicating needle swings right or left.

Direct Reading Flowmeters

• DIRECT READING Flowmeters, developed by the Eclipse Aviation Corp., East Orange, N. J., as an accurate means of measuring instantaneous rate of flow of liquids in gallons or pounds per hour, are particularly adaptable for determining fuel consumption during internal combustion engine tests.

Employment of the Eclipse Flowmeter



Eclipse Flowmeter for aircraft

for determining fuel consumption during engine testing eliminates measuring or weighing of fuel and recording of the time required to consume. The instantaneous rate of flow in lbs. per hr., is indicated within an accuracy of 1% of scale reading and is unaffected by the viscosity of the liquid. Changes in fuel density affect the accuracy of the instrument by less than 0.25% for a variance of ± 10% from a mean fuel density.

By recording instantaneous rate of flow in lbs. per hr., variation in fuel consumption caused by adjustments made while operating, can be immediately noted.

Although the instruments are manufactured in several models and capacities, construction is basically the same, consisting of a tapered internal column and a colored float which moves upward within a cylindrical glass tube as the rate of flow increases. The position of the upper surface of the float indicates on the scale markings, the lbs. per hr., rate of flow.

For general use, particularly in aircraft installations, two scales are provided—from 60-300 pounds per hour and from 10-50 gallons per hour. The scale markings on the latter are based upon average fuel density equal to that of commonly used aviation gasoline. For accurate results, the gallons per hour scale should not be depended upon unless correction is made for the specific gravity of the liquid being measured, as the instrument measures mass flow.

Calibration does not depend upon springs and there is only one moving part—the float. Liquid entering the unit's lower end passes upward between the inside diameter of the float and the tapered internal column. As the flow increases, the float moves upward, visible within the cylindrical glass tube. The specific gravity of the float is such that it is easily lifted and thus the loss of head by the introduction of the Flowmeter in the fuel supply line is negligible.

In certain models, liquid leaves the instrument by passing downward through the center of the internal column. In other models, (large capacity) liquid passes from the upper end of the unit downward through an external tube which is made flexible to preclude the possibility of damage to the cylindrical glass tube because of the differences in their coefficient of expansion.

In the upper end there is a vent screw for relieving air locks which may develop during the initial priming of the fuel supply system or because of fuel shortage. Under normal operating conditions, the fuel velocity is sufficient to carry away any air bubbles released from the fuel.

The engine testing model, which records rate of flow from 50-600 lbs. per hr., has in the lower housing a strainer to prevent the entrance of foreign particles.

One of the models available is equipped with illuminated, enlarged scale readings (from 160-400 lbs. per hr.) for remote observation and is particularly adaptable for installation in outboard engine nacelles.

Installation of the Flowmeter is simple, including only mounting of the unit in an upright position and locating the Flowmeter in the fuel supply line so that formation of air locks is minimized. In measuring gravity flow, the fuel supply must be above the Flowmeter so that sufficient head will be created. However, there is no measured change of accuracy because of variance of pressure head on the instrument.

Sanding Machine

• A UNIQUE sanding and polishing machine designed for industrial use and weighing 7 pounds while operating on 70 or more pounds of compressed air, (using 6 cu. ft. of air per minute) is being marketed by the Sterling Products Co. of Detroit and Los Angeles.

Called the Speed-Bloc Sander, the machine uses an oscillating or reciprocal motion. The stroke travel of the abrasive pad is 1¼", at the rate of between 2,500 and 3,000 oscillations per minute. The pad moves back and forth with the same motion as in hand sanding, hence it does not leave a graining or chasing in the surface.

The pad device, which carries the abrasive paper is made of rubber and felt and bridged so that it is fully flexible, making it applicable to convex or concave surfaces, along mouldings and in places difficult to sand.

Due to its light weight and small size, being 7¾"×4¾"×3¾", it can be used on all types of work. It is also fitted witn a water connection making it available for wet or dry sanding.

The motor is sealed in an aluminum case, protecting it from abrasive dust and water. Several sheets of abrasive may be attached to the pad at one loading, a heavier mesh being usable to speed production.

Fabric Rejuvenator

• GLIDAIR FABRICOTE is a rejuvenator of cracked or checked aircraft fabric which eliminates the necessity of removing the old finish to bring the covering back to its proper tautness. It softens the finish, causes the cracks and checks to amalgamate, tautens the fabric and forms a good foundation for the application of the final finish coats.

After the plane is thoroughly cleansed of dirt and wax, three coats of Fabricote are sprayed on the fabric, the last being left on until the fabric seems to go slack and the cracks and checks have disappeared. The pigmented dope is then applied.

The rejuvenator is manufactured by the Glidden Manufacturing Co., Cleveland, Ohio.

Washers For Aircraft

• A COMPLETE line of washers, especially adapted for the aircraft industry has been added by Wrought Washer Mfg. Co., Milwaukee, Wis.

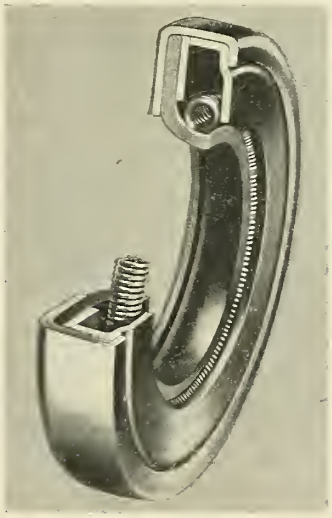
Following U. S. Army and Navy standards, these washers can be obtained in wrought iron or steel, stainless or tinned steel, brass, copper, aluminum, or aluminum alloy.

Eight large pattern washers in bolt sizes ranging from #10 to ⅝", are included in the line conforming to government standard AN970, while 15 small pattern washers in bolt sizes from #3 to 1", conform to AN960.

Fluid and Oil Seal

• AN OIL and grease seal, known as type BB, for application to all types of machinery embodying shafts, has just been developed by National Motor Bearing Co., Oakland, Calif.

The seal, which completely excludes extraneous matter and provides positive imprisonment of oil, grease and fluids, consists of an outer steel case which permanently locks the seal assembly.



National oil and grease seal

The outer case has a pressfit accuracy of ± .002" tolerance on the diameter and an equalizing annular garter spring within the case provides uniformly continuous contact, pressing against the sealing member at all points circumferentially.

The actual sealing member contacting the moving shaft is made of various materials, usually a processed leather, to suit various conditions such as temperature, peripheral speeds, unbalanced pressures and chemical activity. Saetan, a new type of leather, is the most popular used.

All types of machinery, particularly motors and engines, are adaptable to the new seal, eliminating the need of stuffing boxes, labyrinths and other baffling means.

Applicable to aircraft engines, the new seal is used on the superchargers of Kinner products.

Long-Stroke Drawing Press

• THE INCREASING use of new streamlined products is demanding facilities for deeper drawing operations than many existing press equipment are capable of handling and the Hydraulic Press Manufacturing Co., of Mt. Gilead, Ohio, has endeavored to meet this requirement by developing a long-stroke press of their Hydro-Power Fastraverse class, equipped with synchronized-pressure die cushion.

The die cushion added to the hydropower press fits it for performing deeper draws in single press operations. This cushion is actuated by a series of hydraulic cylinders which are hydraulically connected with the same source of pressure that operates the press itself. Thus the action of the die cushion is synchronized with press movements and pressure, the blank-holding pressure being proportioned to the drawing pressure.

The Hydro-Power Fastraverse Press including the die cushion is self-contained with direct-motor drive through the hydro-power unit, mounted on the press-head, and fitted with a complete system of controls for both press and die cushion.

The operator's press controls, including gauge, are conveniently grouped on the right hand press column, while the die cushion pressure regulator and gauge are located at the left.

All-Metal Vacuum Switch

• A SMALL vacuum switch, designed to take advantage of the absence of an arc when breaking a circuit in a high vacuum, has been announced by the General Electric Co. Although this vacuum switch is about ¾" in diameter, 1½" long, and can be operated by a fraction of an ounce of pressure, it is capable of interrupting as much as 5 h.p. as fast as 30 times a second. Designated as the Type FA-6 vacuum switch, this device is rated 10 amperes, 250 volts d-c., or 440 volts a-c.

The switch is made of steel, hydrogen-copper-brazed and exhausted to a high vacuum through a hollow steel operating stem which passes into the vacuum contact chamber through a thin steel end-wall whose flexibility permits the slight motion necessary for operation of the contact. The leading-in wires to the contacts are sealed in glass beads inside Fernico alloy thimbles, inserted through the heavier opposite end-wall of the chamber, providing a sturdy and reliable gas-tight joint.

With this construction, the vacuum switch can be used in almost any location, including those subject to extreme shock and vibration.

Oil and Grease Remover

• A NEW process for removing oil, grease, dirt, smut, etc., from metal and other surfaces is being marketed under the trade name "Magnusol" by the Magnus Chemical Co., Garwood, N. J.

Use of the new solvent is said to complete cleaning jobs in quicker time and with more satisfactory results than with other cleaning products. It can be used on motor blocks, chasses, machinery, in maintenance work or as a pre-cleaner for metal parts in the process of manufacture. It penetrates and places in an easily rinsable condition, all oil or grease smears, or stains resulting from them.

Small parts can be dipped in the solution, which can be used cold, but quicker cleaning is accomplished by a solution heated to 140° F. Larger parts can either be painted or sprayed, allowing the solution to penetrate. A pressure hose or a thorough rinse completes the process.

Electric Screw Drivers

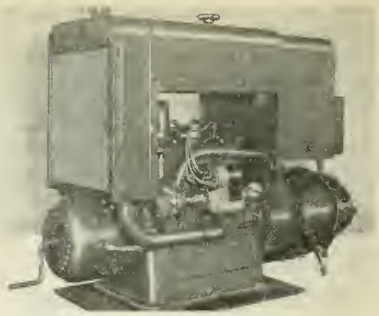
• THE CHICAGO Pneumatic Tool Co., New York, N. Y., has just designed a pistol grip hicycle electric screw driver and nut runner to fill the demand for a light weight, but powerful tool.

The heavy duty self-contained switch mounted in a saw type pistol grip handle is actuated by an inside trigger. The gears are of special heat-treated and hardened steel, while large oversized ball bearings are used throughout. All bearing and gears are grease lubricated and Zerk fittings are installed. Standard equipment includes two screw driver bits with or without finders or one socket wrench and 25 feet of conductor cable. The tool comes in three types which will drive #12 to #14 size screws and tighten bolts ranging from 3/16 to ¼".

Airways Beacon Power Plants

• THE MODERN airways beacon is automatically operated by electrical energy which is either generated by an internal combusion engine and generator located at the beacon or supplied by a passing power line. Since the greatest air line mileage is over sparsely settled country, and since beacons must be located on hills above obstructions, a majority are equipped with engine generator units.

When the first beacons were constructed the loads were of low enough wattage to fit the output of the then standard direct current farm light plants. This required DC equipment where plants were used and alternating current equipment on power lines. With the increasing demand for AC plants, such units were developed and are now used



Airways beacon engine generator set

on the latest installations, permitting standardizing equipment whether operated from gas electric sets or power lines.

The AC plants are designed for inherent good voltage regulation, thereby eliminating the necessity of using voltage regulators. Among present units this is accomplished by having the exciter and alternator windings in the same slots with the resultant exciter voltage rising as the AC load is applied, by having the plant speed increased as the AC load increases by means of an electrical series governor.

For maximum dependability two plants are always used in one beacon with the operation being alternated from night to night. In case of failure of one plant, either in starting or operation, the other unit automatically starts and carries the load until repairs are made.

The engine generator units automatically crank, start and carry the load as it becomes dark and then stop on return of daylight. The starting and stopping is controlled either by an astronomical clock or light sensitive device. The clock corrects for the change of sunrise and sunset during the seasons, while the light sensitive device is directly effected by the amount of light outdoors. The latter is coming into more general use as it takes care of the unusual conditions caused by a cloudy or bright sky.

The plant control, which is actuated by the clock or light sensitive device, goes through an automatic sequence to properly crank, choke, start and connect the plant to the load. It must be simple (to reduce the number of parts that may cause trouble) and at the same time properly perform its required functions and be highly dependable.

The 32-volt storage battery is usually used to provide the energy for cranking and operation of the control. Cranking is accomplished by running the generator as a motor on direct current units, or the exciter on alternating current units. Geared type starters are not generally employed because of their low cranking speeds and danger of gears sticking or clashing. The battery is kept charged by a small current from the generator or exciter as limited by an adjustable resistor. Protection against complete discharge of the battery should the engine fail to start while cranking, is provided by a thermal device, which may be set to disconnect the unit after a predetermined cranking period.

Where units are used in locations of severe winter weather, they are equipped with thermostats and oil heaters to prevent the plant dropping below a set temperature and so result in difficult starting or freezing. The thermostat is located in the engine water jacket and its functions are to start the plant and heat the oil when the water temperature drops to approximately 40° F. The unit is allowed to run until the water reaches some preset hot temperature when it is again shut down. This control is arranged to operate independently of the load circuit so as not to interfere with normal operation.

The engines of these units are most important since they present numerous possibilities of trouble. There are valves, spark plugs, rings, carburetors, ignition and other essential parts all of which must properly function together. Speeds range from 900 to 1200 r.p.m. to provide good life, minimum vibration and reasonable size and cost. The engines are expected to operate for approximately two years without a complete overhaul, and construction must be such that minor adjustments are easily made without dismantling equipment or moving the unit. The oil pan is usually a large cast base with easily removable side plates for inspection of bearings or other running parts. The large oil capacity decreases the frequency of filling crankcase dilution, and also reduces the possibility of bearing trouble.

Fuel economy is an important feature. Not only do the engines operate a great number of hours but frequently the transportation of fuel to isolated units becomes a serious and costly problem. The operating cost of a poorly-designed inefficient plant is far more than a well-designed unit and amounts to more than the difference in initial cost of a better unit when a year's supply is considered. To obtain best economy the engine must be operated very near its full load rating. The fuel consumption for well designed air beacon plants of 2 to 5 kw. rating is approximately 9/10 of a quart of gasoline per kw. hour. A 500-gallon fuel tank is usually provided at the beacon.

Necessary attendance is partly provided by a neighboring farmer who each night observes whether the beacon functions and keeps it supplied with fuel and oil. A trained mechanic usually visits the unit at intervals of approximately two weeks to make a check and attend to minor adjustments. For major overhaul the unit is usually removed and taken to a district shop.

TRADE LITERATURE

Tube Couplings

• BULLETIN 37 issued by the Parker Appliance Co., Cleveland, Ohio, is the first edition of a price list of tube couplings and associated equipment. Similar bulletins covering Parker valves and publications of the company's other products are being prepared.

In Bulletin 37, which contains 64 pages, is found a most exhaustive array of couplings and fittings, including flexible hose, manifolds and hose fittings. In addition there are tables and specifications of fittings, materials and combination fittings.

Abrasive Wheels

• THE BAKELITE Corp., Bound Brook, N. J., has just issued a 24-page booklet titled "High Speed Abrasive Wheels Bonded with Bakelite Resinoid."

This booklet tells the story of the development of the abrasive wheel and interpolates the part Bakelite has played in making it a fast, productive tool. It narrates the work of grinding wheels and illustrates their application in various industries, including aircraft. Among their uses are grinding of camshafts and valve stems; sharpening or "gumming" saws; and for forming and sharpening high-speed tools and cutters.

Molybdenum Facts

• THE FIRST issue of the Moly Matrix, a house organ published by the Climax Molybdenum Co., New York, N. Y., is full of interesting material concerning molybdenum. The publication is intended not only to provide information, but to call attention to molybdenum steels which possess outstanding qualities of strength and durability.

In the issue Volume I, Number 1, are items on molybdenum in steel and cast iron, data on where to buy and a report of the service facilities of the company.

Siddeley Engines

• A 16-PAGE booklet, well illustrated and nicely put together, has been published by Armstrong Siddeley Motors, Ltd., of Coventry, England. It is a descriptive piece of literature relating complete and detailed facts concerning the line of Siddeley engines ranging from 80 to 800 horsepower.

Beginning with the Leopard 800-h.p. engine, the booklet gives leading constructional features and power curves of the Tiger III and IV, Panther VI and VII, Jaguar, Serval, Cheetah V and VI, Lynx, Mongoose, Genet Major and Genet engines. The booklet's center section contains a diagram showing the Siddeley range and depicts various aircraft powered by these engines.

Brass Die Castings

• PUBLISHED BY the Doehler Die Casting Co., of Toledo, Ohio, "Brass Die Castings with the Strength of Steel" is a simple booklet which states as tersely as possible, in illustrations and copy, what brass die castings are and what they will do.

Three alloys, found to meet practically all commercial requirements are described and illustrated. They are Brastil, Manganese Bronze and White Nickel Brass. Physical properties of all three are tabulated.

Ball Bearings

• A NEW catalog on "Straight Roller Radial and Roller Thrust Bearings" has just been issued by Bantam Ball Bearing Co., South Bend, Ind., which contains a complete listing of sizes and a concise treatment of various types of straight roller bearings, radial and thrust.

A list of dimensions and capacities, both in metric and inch capacities is given for radial roller bearings, as well as the other types described. A table of speed factors, general modifications factors and a table on tolerances and fitting practices are included.

The catalog is well illustrated, showing various types of bearings covered. In addition, a number of line drawings are used to show various bearing mountings.

Aircraft Fuel Pumps

• A MOST inclusive and comprenhensive catalog of aircraft fuel pumps is published in the new 100-page booklet distributed by the Romec Pump Co., Elyria, Ohio.

Containing general information, prints and specifications of fuel pumps and vacuum instrument pumps, it is a cross-section of the development of this necessary piece of equipment for the aircraft engine.

The history of the development of the fuel pump is especially interesting as is the general description of the operation, capacity and construction thereof.

Numerous line drawings show constructional and installation features of the various fuel pumps. Specifications of each pump, together with material and workmanship, detail and general requirements, methods of inspection and tests makes the publication an invaluable asset to the engine manufacturer and to the service and repair man.

Niagara Tools and Machines

• BULLETIN NO. 71-E, containing descriptions and illustrations of machines and tools manufactured by the Niagara Machine & Tool Works, Buffalo, N. Y., is an interesting 32-page booklet containing some valuable information on the products included therein.

Among the machines illustrated are the power squaring shears in 14 different models, a gear clutch, inclinable press, punch press and rotary slitting shears. Accompanying each illustration of a power shear, is a table giving important constructional and output data of the machine.

REVIEW OF BOOKS

HANDBOOK OF AERONAUTICS

• PUBLISHED BY Isaac Pitman & Sons, Ltd., the new Handbook of Aeronautics is presented in two volumes.

Volume I, a compendium of the modern practice of aeronautical engineering, is the second and enlarged edition of a previous issue. The publication is printed under the authority of the Royal Aeronautical Society and provides, accurately and authoritatively, information which should be of every day use to the designer and builder of aircraft, and the aeronautical engineer. Containing eleven enlightening chapters, the book is most complete, including such topics as aerodynamics, materials, meteorology, instruments, construction and a chapter on gliders and sailplanes.

Volume II, by Andrew Swan, is on the design and practice of aircraft engines. The information is classed under thirteen different headings for ease of reference. Included in the fourteen chapters is one on compression ignition engines and another on propellers, the latter the work of Capt. R. N. Liptrot.

JUNIOR AIRCRAFT YEAR BOOK

• AN ATTRACTIVE volume of 250 pages, containing in condensed form the story of aviation in 1933 has been issued by the Aeronautical Chamber of Commerce under the title "Junior Aircraft Year Book for 1934."

The book contains most of the important chapters of the standard year book and has the three-view drawings of aircraft and two-view drawings of aircraft engines found in its larger counterpart.

Boeing Transport Model 247-D

● Increased performance, better appearance, more comfort and new engines and propellers, are features of the new Boeing transport Model 247-D which recently completed flight tests at Seattle.

Structurally and in basic appearance, the new transport is similar to the 60 transports that have been flying the United Air Line route since 1933. However, the 247-D has larger engine nacelles, full N.A.C.A. cowls, a sloping windshield and cleaner streamling.

Replacing the direct-drive P. & W. Wasps and two-bladed controllable pitch propellers used in the 247, the new transports have two geared 550 h.p. supercharged Wasps (a description of which appeared in AERO DIGEST for October) and three-bladed Hamilton Standard controllable pitch metal propellers. The engines have a blower ratio of 12:1 and a propeller gear ratio of 3:2.

Cabin noise has been materially decreased by the use of new-type insulation in the passenger and pilot compartments, elimination of individual ventilators and reduction of propeller tip noise.

Greater passenger comfort has been provided for in the adoption of a hot air heating system, an improved ventilating system, and a new head rest on the adjustable reclining chairs. The hot air heating system maintains comfortable temperature at all altitudes, and the ventilating system completely changes the cabin air once every 45 seconds, by means of two fresh air intakes with ducts which distribute air along the cabin ceiling and two outlets at the base of the cabin walls.

Flush type rivets are used around the leading edge of the stabilizer and wing which is the Boeing No. 106 section, having a 15-foot chord at the root and a mean aerodynamic chord of 144.10 inches. The elevator and rudder are of metal construction, fabric covered, rather than of all-metal construction as in the 247's. The trailing edge flap built into the rudder is of the divided type, with the top half acting as an aerodynamic balance and the lower half serving as a trimming flap.

Specifications and performance figures of the Model 247-D are as follows:

Specifications

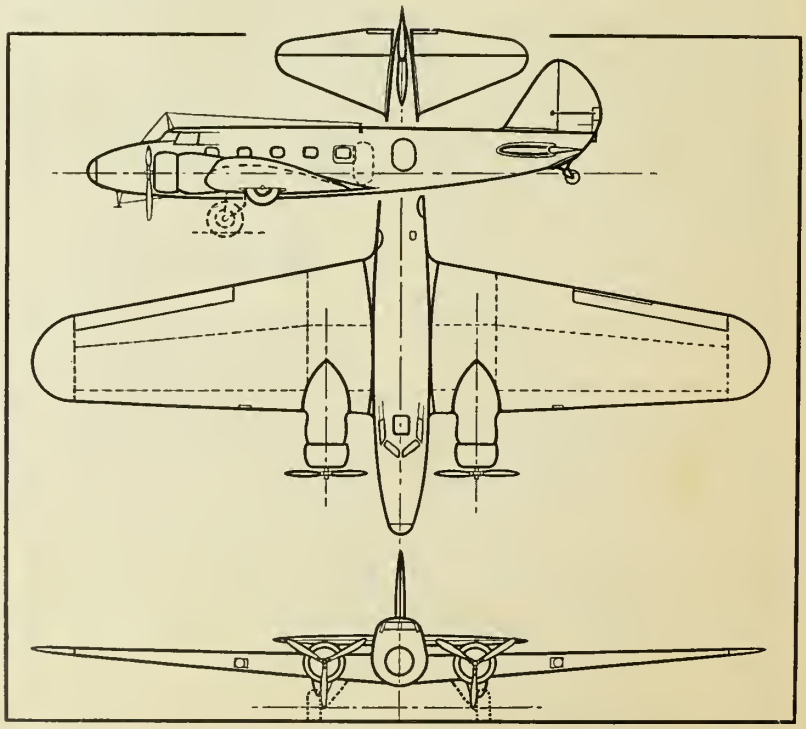
Length overall	51 feet 7 inches
Height overall	12 feet 1¾ inches
Wing span	74 feet
Tail span	25 feet 6 inches
Wheel tread	17 feet 3 inches
Aileron span	16 feet 7 inches
Aileron chord aft of hinge	18 inches
Dihedral	3° 52′
Sweepback	0°
Wing loading	16.3 lbs./sq. ft.
Power loading	12.4 lbs./h.p.

Areas (square feet)

Wing area including ailerons	836.13
Ailerons	60.8
Stabilizer	82.84
Elevators	47.66
Rudder	27.9
Fin	17.6

Weights (pounds)

Weight empty	8,940
Useful load	4,710



Details and outlines of the newest Boeing 247-D, the type flown by Pangborn and Turner in the MacRobertson Race

Pilot and crew (2)	340
Fuel (273 gallons)	1,638
Oil (20 gallons)	150
Payload	2,582
Gross weight	13,650

Performance (full load)

Top speed at 8,000 ft.	200 m.p.h.
Cruising speed at 12,000 ft.	189 m.p.h.
Cruising speed at 8,000 ft.	180 m.p.h.
Landing speed (sea level)	62 m.p.h.
Initial climb	1,150 ft. per min.
Climb at 6,600 ft.	1,200 ft. per min.
Climb at 8,000 ft.	1,100 ft. per min.
Takeoff run (sea level)	925 feet
Takeoff time (sea level)	18 seconds
Range at 75% h.p.	800 miles
Range at 62.5% h.p.	900 miles
Service ceiling	25,400 feet
Absolute ceiling	27,200 feet
Absolute ceiling (one engine)	11,500 feet

Recent Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark atttorney, 511 Eleventh Street, N. W. Washington, D. C.

Propeller construction for aircraft. Willard P. Perry, Scudder Falls, N. J. (1,973,266)

Aircraft structure. Earl J. W. Ragsdale, Norristown, Pa., assignor to Edward G. Budd Mfg. Co., Philadelphia, Pa. (1,973,268)

Propeller (variable-pitch). Francis O'Brien, Framingham, Mass. (1,973,355)

Device for displaying flags and like on airplanes. Erich Pieper, Altona-on-the-Elbe, Germany. (1,973,389)

Screw propeller. Victor Lougheed, Washington, D. C. (1,973,573)

Propeller. James R. Ballard and Dewey P. Saucier, Shreveport, La. (1,973,598)

Take-off device for airplanes. William H. Wood, Toronto, Ont., Canada. (1,973,835)

Aerial banner. William A. Bohannon, Mineola, and Clara B. Gilbert, New York, N. Y. (7,974,039)

Airplane. Louis Cormona, Throop, Pa. (1,974,040)

Aircraft sustaining rotor. Agnew E. Larsen, Huntington Valley, Pa., assignor to Autogiro Co. (1,974,074)

Direction indicator. Elmer A. Sperry, Jr., Brooklyn, N. Y., assignor to Sperry Gyroscope Co. (1,974,220)

Airfoil construction. George E. Barnhart, Pasadena, Calif. (1,974,407)

Landing gear. John S. Kean, Philadelphia, Pa. (1,974,424)

Means for launching aircraft. Robert H. Mayo, London, England. (1,974,684)

Rotative-winged aircraft and method of operation. Juan de la Cierva, Madrid, Spain, assignor to Autogiro Co. (1,974,738)

Airplane wing structure. John E. Younger, Berkeley, Calif., assignor to Capelis Safety Airplane Corp., Oakland, Calif. (1,974,764)

Steering apparatus for aircraft. Fritz von Opel, Russelsheim - on - the - Main, Germany. (1,974,884)

Construction for aircraft. Albert B. Gardner, Racine, Wis. (1,975,098)

Aircraft. Frank W. McIntyre, Ocean Beach, Calif. (1,975,116)

Rotating wing aircraft. Thomas E. Moodie, Atlanta, Ga. (1,975,118)

Aircraft. Walter Rieseler and Walter Kreiser, Keyport, N. J., assignors to Edward B. Wilford, Philadelphia, Pa. (1,975,124)

Course recorder. Eric C. Sparling, Garden City, N. Y., assignor to Sperry Gyroscope Co. (1,975,180)

Gyroscopic instrument (horizon indicator). Harry D. Allen, Haywards, Calif. (1,975,442)

Gyroscopic apparatus. John P. Brown, London, England, assignor to P. B. Devinator, Ltd., same place. (1,975,740)

Camshaft drive for radial engines. George W. Codrington, Lakewood, Ohio. (1,975,826)

Laminated body (fuselages, etc.) and method of making. William Harper, Jr., Port Washington, N. Y., assignor to Super-Marine Systems, Inc., New York, N. Y. (1,976,257)

Aviation marker. Edward C. Vrooman, Schenectady, N. Y., assignor to Locke Insulator Corp., Baltimore, Md. (1,976,378)

Combination fuel valve and tank release. Edmund L. Noonan, Dorchester, Mass., assignor to Curtiss Aeroplane & Motor Co., Buffalo, N. Y. (1,976,456)

Airfoil. Ralph D. Carleton, Snyder, and Raymond C. Blaylock, Kenmore, N. Y., assignors to Curtiss Aeroplane & Motor Co. (1,976,480)

Slot and flap combination. Edward R. Child, Tonowanda, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,976,482)

Stall indicator for airplanes. Macy O. Teetor, Hagerstown, Ind. (1,976,587)

Beacon and air current indicator. Oscar Werner, South Bend, Ind., assignor to Westinghouse Electric & Mfg. Co. (1,976,706)

Niagara Two-Place Amphibion

● Introduction of a two-place amphibion by Niagara Amphibious Aircraft Corp., Buffalo, N. Y., marks the entry of that company in the aviation field.

Known as the Niagara Amphibion, the plane features rugged construction, low cost and economical operation. The engine mount is arranged to take a power plant of from 60 to 100 horsepower.

The plywood hull is of semi-monocoque construction with either a closed or open cockpit. The retractable landing gear is simple in operation, carries 18 x 8 x 3 Goodyear wheels, with or without brakes, and has a tread of 56 inches. A new version of the Niagara Amphibion will have an all-metal hull and is intended for use in government service as a primary training ship and light craft for official business.

At present a 60-horsepower LeBlond engine is used. This power plant gives a top speed of 93 m.p.h., a cruising speed of 85 m.p.h., and a landing speed of 28 m.p.h. With full load, take-off is accomplished in a run of about 400 feet. With a 75 h.p. engine, a top speed of 112 m.p.h. is calculated, while the take-off run will be reduced to 250 feet. Fully loaded, the amphibion cruises 300 miles with 10 gallons of fuel and 3 gallons of oil. Economical operation is evidenced in a fuel consumption at the rate of a little more than three gallons an hour, which is equal to approximately 35 miles to the gallon.

Specifications

Wing span	36 feet
Length	24 feet 3 inches
Height to propeller center line	8 feet
Wing chord	5 feet
Wing area including ailerons	180 sq. feet
Wing loading	5.9 lbs./sq. ft.
Power loading (LeBlond 70)	15.7 lbs./h.p.
Power loading (Jacobs 55)	19.8 lbs/h.p.
Draft at chine, fully loaded	2.5 inches
Weight empty	646 pounds
Weight gross (with LeBlond)	1039 pounds
Gasoline capacity	10 gallons
Oil capacity	3 gallons

Personalities

by Caldwell

● MAX HOLTZEM, who came to this country in 1928 and served for two years as test pilot with A. H. G. Fokker at Teterboro, was born in Germany in 1892, and for nineteen years lived the pleasant life of a German student. In time he might have become a brewer, a manufacturer of toys, or the fellow who played the big umpa-umpa horn in a German band—these being the most popular activities of the pre-war German. But in 1911 he decided to go in for aviation, which at that time was not regarded as a sane profession; in fact, even to this day there linger a few doubts about it. But in 1911 the Prussian Landcourt, which administered Max's estate, was convinced that he should be restrained, for it wrote a four-page decision declaring that none of his inheritance should be spent to make him into a "Luftschiffer" or into anything else connected with the navigation of the air. Similar decisions have been made by Surrogates in American Courts, and with equal lack of effect; for adventurous young men in all nations are much alike: they will do what they want to do, and the old judges may go chase themselves around the archives.

After completing his course in a Technical School in Cologne, Max Holtzem built his own airplane, a contraption patterned after Bleriot and Deperdussin designs with a Delfosse rotary engine. A minor difference was that the Bleriots and Deperdussins flew, more or less, while the Holtzem contented itself with rolling rapidly along the ground. The only time it ever got into the air was when it hit a bump and inadvertently rose an inch or so, returning almost instantly to the earth—a fact to which Max undoubtedly owes his life, for at that time he didn't know any more about test-flying than he did about designing.

In 1913 he entered the Imperial Army Air Force, learned to fly, and in early August of 1914 went to war with a Tauben Squadron through Luxemburg into France. The feeling of distrust, amounting in some instances to actual dislike, which the French and others gradually built up about the Germans, could in no way be attributed to the military activities of young Holtzem, which at first were of the most harmless and amusing variety. Seated in his old Taube, and armed only with a Very pistol used for signalling, he flew up and down the Front, admiring the peaceful countryside with the peasants still gathering their crops and the armies on both sides laughingly digging big holes in the ground and crawling into them hoping to go to sleep for the duration of the war. Occasionally—say once a week or so—Max would sight one of the enemy airmen, fly along beside him, and wave in a sporting and friendly way, and the enemy would wave back, all in the most kindly and affectionate manner. Once Max got a big piece of pipe, stuck his Very pistol down one end of it, and fired a harmless puff of smoke and flame toward one of the enemy pilots, who naturally thought he was being shot with a cannon. Even when Max explained the joke to him, by pulling out the pistol and waving it with merry laughter, the Frenchman sulked a bit, and wouldn't play. Evidently he thought that was carrying a joke too far, pretending to shoot another pilot in a war.

Holtzem at Flanders in 1917

This merry waggery might have continued indefinitely, so far as most of the pilots on both sides were concerned, but some keen merchant got the unhappy idea of taking up a revolver, and another inventive genius took up a shotgun and fired a charge of birdshot at one of the opposing team, hitting him. This was playing too rough, of course, so you can hardly blame the gent with the load of buckshot in him for going after that shot-gun joker with a machine gun. One thing led to another, and the first thing you know someone got killed; it was almost bound to happen, I suppose, after a few months, but it certainly spoiled the war for me; by the time I got there, in 1916, pilots on opposing teams were actually disliking each other and were taking pot shots before breakfast. Pilots like Richthofen and Rickenbacker and Bishop and Ball couldn't enjoy their bacon and eggs unless they had bagged at least an enemy student on his first flight over the lines. Personally, I never held with this practice, as being too uncultured, not to say actually plebian. I preferred to drop bombs at night, when I couldn't see what I was hitting: this gave the German soldier an equal sporting chance with the French or Belgian peasant, and I wouldn't be surprised if I bagged as many of the one as I did of the other. Nor, for that matter, would I be unduly startled or grieved to learn that I hadn't hit anyone at all. To me the war was just an amusing and distinctly foolish interlude in a placid existence and I never took it very seriously; it wasn't worth it, as time has proved.

After six pleasant and peaceful months, Max Holtzem was sent from the safety of the Front to the Pfalz aircraft factory and the more dangerous work of test-flying the early Pfalz pursuit planes, which were copies of the French Morane-Saulnier Gnome-engined parasol monoplane. In a dive they could be folded up like a parasol, hence the name Pfalz. During the last 15 months of the war Max was with a Bavarian Pursuit Squadron on the Western Front, where

he brought down three planes. By this time, of course, both sides were taking the war seriously and getting rather nasty and unsporting about it all; so on Nov. 11, 1918, they decided to call it off, go back home, and spend the next 20 years preparing for the next war and avoiding payment for the last one. All had been battling for their national honor, only to learn that there was no such thing.

After the war Max went to South America, where he became a well-known figure in the aviation history of Argentina, instructing and passenger-flying. Then he formed a flying circus, being the first pilot in South America to transfer an acrobat from a plane to an automobile; a feat that was unequalled until the United States Government transferred several million pigs from the farms into a deficit in the National Treasury. After two years with Fokker, Max Holtzem went to Newport, R. I., as airport manager and flying instructor for two seasons, and then spent a season with Nyack Airways. He has become an American citizen and is now resting in the peaceful rural regions of New Jersey as a Sportsman Pilot, but would welcome the opportunity to become less sporting and more commercial if he could find a job. Some 15 millions of his fellow-citizens are in practically the same boat, so he needn't feel that his adopted country is slighting him.

● EVERY NOW and then one of the weird characters I associated with in the wild days of my youth comes tottering out to Fallen Arches, my Long Island retreat, to recall the days when both of us were damn good men riding high, wide and handsome on the stormy waves of life.

A recent visitor who drifted into the doldrums where I pass my declining years was John E. "Pink Whiskers" Whitbeck, who was born to delude me at Geneva, N. Y., on the nineteenth of March, 1889. He attended public and high schools at Phelps, N. Y., and took a three-year course in Mechanical Engineering at Colgate University, where he had several close shaves when it came to examinations and kept his instructors in a lather. However, he finally managed to brush through by the width of a whisker. But the experience definitely set him against not only close shaves but shaving, and from that time on he became a beaver.

For three years after graduation he served as an apprentice machinist in the shops of the Walker Steam Car Co., and the Maxwell-Briscoe Motor Co., Tarrytown, N. Y., then joined the Navy in 1911, transferring during the war to the Army Air Service, Aug. 16, 1915, from which he resigned in 1920 with the rank of Captain.

During the war he was Chief Inspector for the Army at the Curtiss School at Newport News, with Captain Baldwin, then organizing a flight in April, 1918, to test the first of the Liberty-engined Bristol Fighters built at Buffalo. Knowing something about what an airplane was, he refused to go on with the tests and was threatened with court martial. He just blew fiercely through his whiskers and remarked that if the Germans wanted to kill American pilots that was their business, but that if the Army wanted him to kill American pilots they'd have to wait until he went over and enlisted in the German forces. Some one else then organized another test crew and many pilots were killed trying to fly the Bristol, which was designed for a 200 h.p. Sunbeam and into which our

He was worn out building airports—and then he lit a Camel!

enthusiastic engineers had hopefully inserted a 400 h.p. Liberty, which naturally pulled the job to pieces.

From 1920 to 1926 Whitbeck was Superintendent of the Eastern Division of the U. S. Air Mail Service (New York to Chicago). He helped light the airway and inaugurated the first night flying schedules. He owned and operated Hadley Airport, New Brunswick, N. J., which handled all air mail for New York City from 1924 to 1930. Then for two years, from 1927, he was Operations Manager and Chief Airport Engineer for Pan American Airways until their operations and maintenance organizations were completed. He has selected and made engineering plans for 37 major airports in this country and abroad, including Boston, Buffalo, Cleveland, Washington, Chicago, San Juan, Miami, Havana, Port au Prince, Belize and Nagasaki, Japan.

When Pink Whiskers drifted in recently it was the first time I had seen him since early on the morning of Oct. 19, 1927, when he stood on a wharf at Key West, Florida, nervously shifting from one foot to the other and chewing distractedly on his beard while he watched me trying to induce an FC2 Fairchild to leap into the air with a heavy load of baggage and spare parts and with 376 pounds of United States Air Mail bound for furrin' parts—meaning Havana. There was a fairly stiff breeze blowing up a choppy sea outside the breakwater, and the Fairchild was snorting and pawing the air and the water, undecided which sphere of activity to remain in; I'd get going inside the breakwater, barge out through the opening, and then I'd hit this combination of stiff breeze quartering a sea that had been rolling since the night before, so there I was crabbing into the seas and crabbing into the wind, and getting wet and getting no place, except back for another start. Each time I taxied past for another try I'd wave cheeringly at Whitbeck. Finally he got into the boat that had acted as a mail tender, caught me on one of my scheduled trips into and out of the harbor, and implored me to unload some of the spare propellers and engine parts and tools that the perspiring Fairchild was staggering along with. It was imperative, he said, that the air mail should get going that day, not tomorrow, or in a few days, but *now*. I had already left my mechanic behind to follow by steamer, so I left all the gear and took off again. Not to make a monotonous story even more aggravating, I'll merely add that on my next dash for freedom from the water I waved at Whitbeck, used an uncanny skill for which I was never famous, and really got into the air and headed for Havana. I heard later that Whitbeck immediately fainted from the strain and had to be revived with Bacardi and ice.

You see, what Whitbeck knew (and what I didn't know) was that Pan American had posted a bond of $25,000 to guarantee that their air mail service started from Key West for Havana when the morning mail train got to Key West on Oct. 19. If they had failed to make that trip they would have forfeited the $25,000, and possibly lost the contract. I just happened to be passing through on the 18th on my way to Haiti; and Whitbeck, who knew me from his old Air Mail days at Cleveland when I was testing planes and shovelling ashes for Glenn Martin, suggested that I should wait and take this load of mail across to Havana for him and thus help out an old friend whose airplanes hadn't yet arrived. Ed Music was arriving next day with the first Fokker to be used on the run, but it would be a great help to him, personally, said Pink Whiskers, if I'd just lay over a day and fly this flock of stamp collectors' let-

(*Continued on page* 68)

Ten New Transports Delivered

DELIVERY OF ten new 247-D type Boeing transports, equipped with geared supercharged P. & W. Wasp engines delivering 550 h.p. at 8,000 feet, was made to United Air Lines during October, and the planes will be placed in regular service on the New York-Chicago division of the company's mid-continent airway. As the new transports are substantially faster than the type now being operated by United, a material reduction in time of schedules will be made.

United will soon begin replacing the direct-drive Wasp engines on its 247s with the geared type, equipped with three-bladed Hamilton Standard controllable propellers, to convert its entire fleet of planes to the 247-D type.

New Commuters' Service Operating

AN ADDITIONAL round-trip schedule was added October 1, by United Air Lines on the San Francisco-Los Angeles division of its Pacific coast airway, bringing the number of daily flights between these points up to seven, three of which are scheduled to stop at Fresno and Bakersfield, the others being non-stop. Frequent morning, afternoon, evening and night schedules are operated in each direction.

Plane Sets Record In Flight Over Andes

THE NEW Pan American Douglas plane *San Martin* cut 2 hours 35 minutes off the Santiago to Buenos Aires run on its first flight over the trans-Andean mail route, when 4 hours 55 minutes covered the elapsed time for the distance for which the schedule is 7 hours 30 minutes.

Actual flying time was 4 hours 28 minutes at an average speed of 174 miles an hour. The plane landed and refueled at Mendoza.

The craft left Santiago 2 hours 45 minutes after a tri-motor plane making the regular bi-weekly passenger run and arrived at the Moron base ten minutes after this plane.

Piloted by Chief Pilot W. D. Smith of Pan American, the plane carried Edward Allen from the Douglas factory and several Pan American officials.

In a record flight, the ship crossed the Andes twice on only one engine. Attaining the required altitude on the Chilean side of the mountains, the pilot switched off the right-hand engine and flew into Mendoza on the other. On the return trip he attained the required altitude and then cut off the left engine to cross the mountains on the right engine.

UNITED REDUCES TRAVEL TIME BETWEEN COASTS

NEW SCHEDULES on the mid-continent route, cutting 2 hours 45 minutes from the flying time between New York and Los Angeles, have been inaugurated by United Air Lines in conjunction with General Air Line. Passengers change at Salt Lake City from Boeing to Douglas transports allowing twin-engined service from coast-to-coast. Further reductions in time will be made when the improved Boeings go into service.

Smith Heads American Airlines

ELECTION OF C. R. Smith to the presidency of American Airlines, succeeding Lester D. Seymour who resigned, was announced October 25. Prior to his election to the presidency Smith, who has been with the company for seven years, was vice-president in charge of the Southern Division of American Airlines.

Hanford Adds Larger Equipment

MULTI-MOTOR planes are now flying the Omaha, Sioux City, Sioux Falls and Twin Cities route of the Hanford Air Lines, replacing single-engine planes formerly used, according to Arthur S. Hanford, president. The new planes carry 12 passengers, and two pilots. Hanford said the new equipment was in response to steadily increasing traffic which has taxed the capacity of the smaller ships.

Airline Plans Expansion

EASTERN AIR Lines, Inc., is planning a 4-point improvement program to be effected by the beginning of 1935. In one of the most ambitious developments at present being undertaken in the air transport industry, it proposes passenger service on all routes; new schedules to be operated on a limited stop basis; expenditure of approximately $750,000 for new flying equipment and speeding up of all schedules.

The entire program will increase the company's operations from 10,448 to 15,568 scheduled miles daily, and seat miles from 166,720 to 270,860 daily.

In addition, work has already begun to speed-up the fleet of Curtiss-Wright Condors. Engineers determined that by adding slightly more power and greater degree of streamlining, the planes' useful load capacity will be increased 700 pounds and their cruising speed to 150 miles an hour.

Braniff Speeds Schedule

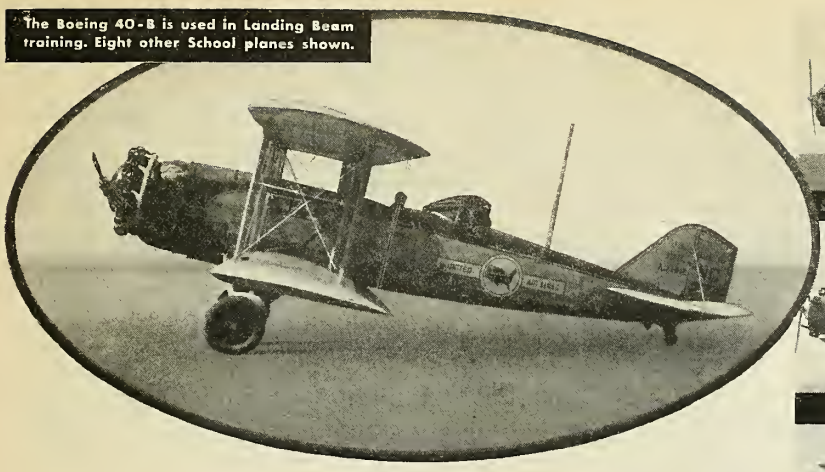
BRANIFF AIRLINES has speeded up its schedule, now leaving Dallas at 8:45 a.m., and arriving in Chicago at 3 p.m. This flight is via Kansas City and allows several connections with planes to the north and east from Chicago. Direct connections with planes leaving for Detroit, Toledo, Cleveland and Pittsburgh are also available. Flying time from Dallas to New York has been cut to eleven hours by this new schedule.

Express Insurance Rates Reduced

THE LIMIT of value on express shipments accepted by air express has been raised from $5,000 to $25,000, and insurance rates revised downward, on companies affiliated with the Air Division of the Railway Express Agency. Under the reduced insurance rates, the tariff includes insurance without extra charge up to $500 for 100 pounds or less. Additional insurance per $100 or fraction thereof has been reduced from fifteen cents to ten cents.

(*Continued on following page*)

The Wright Cyclone-powered Douglas transport which set new records for Pan American Airways in South America



The Boeing 40-B is used in Landing Beam training. Eight other School planes shown.

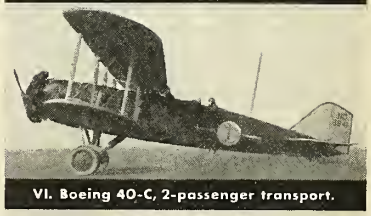
I. Boeing 203 Trainer, 2-place.

II. Boeing 81 Trainer, 2-place.

III. Stearman Trainer, 2-place.

IV. Boeing 203-B, 2-place.

V. Stinson, Junior, 4-place.



VI. Boeing 40-C, 2-passenger transport.

VII. Hamilton monoplone, 8-place.

VIII. Tri-motored Ford Transport.

Boeing students now have LANDING BEAM instruction

FOUR years ago, Boeing School introduced instrument flying in a hooded cockpit as part of the regular curriculum.

Now it rounds out instrument training by the addition of *landing beam* instruction. The plane adopted for this work (Boeing 40B, shown above) is used jointly by Boeing students and United Air Lines pilots.

This direct interchange of experience and facilities with America's most experienced air line, through a side-by-side location on Oakland Airport, is largely responsible for Boeing School's leadership in all departments of flying and technical instruction. Facts flown out of 70,000,000 miles of air-transport operation are put to practical use here, in the laboratories, shops and class rooms.

United Air Lines maintains only one school. The Oakland Airport was chosen as its location because of all-year flying weather, economical living conditions, and the opportunity to observe the day-and-night flying and servicing of the United fleet.

Send for an up-to-date Bulletin, describing newly enriched courses, living conditions, school equipment, etc. The coupon below brings your copy.

Next regular enrollment, January 2

BOEING SCHOOL OF AERONAUTICS

Division of UNITED AIR LINES INC.

BOEING SCHOOL OF AERONAUTICS, Room A-11, Airport, Oakland, California

Gentlemen: I am interested in the courses indicated

- ☐ BOEING AIRLINE PILOT
- ☐ TRANSPORT PILOT
- ☐ LIMITED COMM'L PILOT
- ☐ PRIVATE PILOT
- ☐ AIRLINE MECHANIC
- ☐ AIRLINE OPERATIONS
- ☐ AIRLINE TECHNICIAN (*Open to Engineering graduates*)
- ☐ AIRLINE PILOT and OPERATIONS
- ☐ SPECIAL AIRLINE PILOT (*For Transport Pilots only*)
- ☐ AMATEUR PILOT

Name_____ Age_____

Years in High School_____ Years in College_____

Address_____ Phone_____

City_____ State_____

(Continued from preceding page)

New England Fares Cut

REDUCTIONS IN round-trip passenger fares in northern New England on the lines of Boston-Maine Airways between Boston and Bangor, and on the lines of Boston-Maine—Central Vermont Airways between Boston and Montreal became effective October 22, according to J. V. Sheehan, general passenger agent.

At the same time, the service between Burlington, Vt., and Montreal was suspended for the winter.

The new round-trip fare between Boston and Portland will be $8.10, as compared with $9.50.

On the New Hampshire-Vermont-Montreal line, the round-trip fare between Boston and Montreal is $24.60, as compared with $30.

Northbound, during the winter, the schedules call for the Maine plane to leave Boston at 10:30 a.m., daily, and the New Hampshire-Vermont-Canada line plane to leave Boston at 10:25 a.m., daily.

Southbound, planes leave Bangor at 2:00 p.m., arriving Boston 4:30. Planes leave Montreal at 1:00 p.m., arriving Boston at 4:25 p.m.

Air Mail Poundage Increases

THERE HAS been an increase in air mail volume of 121,221 pounds for July and August over the same two months of last year.

A comparison of the air mail poundage for these months shows 644,172 and 690,177 for a total of 1,334,349 pounds for July and August, 1933 compared with 682,520 and 773,050 for a total of 1,455,570 pounds for July and August 1934.

While the Post Office Department has not had sufficient time to determine the effect of the new six-cent air mail rate, on this increase, department officials are hopeful that the increased volume derived from the new rate will result in higher revenues than those received under the old rate.

Bowen In New Quarters

BOWEN AIR LINES, Fort Worth, Tex., has taken over the former United Air Lines' modern brick building and hangar at Love Field in Dallas and is now occupying it. It is felt the company plans moving its headquarters from Fort Worth to Dallas. The new building includes a shop, hangar, offices, instrument and waiting rooms and offices for officials.

Birmingham Seeks Better Service

CONTINUAL SHIFTING of schedules and changing of mail lines from Birmingham has caused the Junior Chamber of Commerce to launch a city-wide campaign to provide the city with permanent and adequate service. Representatives of a majority of the civic clubs and industrialists are cooperating in the plan. At present the city is served by Delta Airlines, and only recently, Eastern Air Lines rerouted its New Orleans-Atlanta route through Montgomery to Atlanta, omitting Birmingham.

In view of the fact that poundage has increased more than 50 per cent it is felt that Birmingham is entitled to ample facilities for prompt service.

3,500 PASSENGERS FLY IN SLEEPER PLANES

MORE THAN 3,500 passengers have been flown at night in American Airlines' new sleeper planes, according to Charles A. Rheinstrom, general traffic manager of the company. With few exceptions, he said, all have used the berths assigned them. The new sleepers are in nightly service between Chicago and New York, and between Los Angeles to Ft. Worth-Dallas.

TWA Reorganized

OPERATIONS OF Transcontinental & Western Air, Inc., have been consolidated in TWA, Inc., the company formed to bid on air mail contracts last Spring after the former had been excluded from participating in the bidding by the Post Office Department.

At the meeting of the directors, Henry duPont was elected Chairman of the Board.

In addition the following directors were also elected: J. L. Eysmans, Jack Frye, George T. Ladd, C. H. Mathews, Jr., C. I. Morton, John L. Pratt, E. R. Stettinius, Jr., and F. G. Wilson.

Officers chosen include Jack Frye, executive vice-president; J. W. Brennan, vice-president (traffic); Paul E. Richter, Jr., vice-president (operations); F. G. Wilson, vice-president-treasurer; and W. J. Barry, secretary.

Idaho Falls Made Regular Stop

IDAHO FALLS, Idaho was made a regular, instead of a flag stop on the Alfred Frank Line between Salt Lake City and Great Falls, Montana. Installation of the service was attended with a formal celebration at the airport.

More than 800 letters awaited the first mail plane.

U. S.-Alaska Mail Line Seen

AIR MAIL service between Seattle and Alaska is expected to follow purchase of Alaska-Southern Airways by Pan American Airways. New ownership and operation of the line which has operated planes out of Ketchikan and Juneau throughout the year, will enlarge service to the south and bring tri-motored planes to routes now flown with single engined craft. The new service, moreover, will be from Seattle to Ketchikan, Juneau and Fairbanks.

Airline Made Bonded Carrier

EASTERN AIR Lines, Inc., has become a bonded carrier under the customs laws of the United States. The step gives the airline the following rights:

Goods coming into the country by air or steamship from any foreign nation can be transported via Eastern Air Lines under bond for delivery at any city where there is a customs house; transport and export shipments, which are those passing through the United States, enroute from one foreign nation to another foreign nation, may be flown in bond from the port of entry to the port of departure.

Until now there has been no air commerce through the United States of bonded merchandise. All imports are bonded until they are passed through customs and duty is paid or they are admitted duty free.

World's Series Taxes Airlines

AIRLINE TRAVEL in and out of St. Louis increased sharply during the World's Series, when second and third sections were used daily on the schedules of American Airlines to and from St. Louis.

On the fifth day of the series when the two contending teams traveled to Detroit, seven sections, carrying 71 passengers, were required on the 5 p.m. schedule. On the morning of the same day, there were four sections from Chicago.

TWA planes also carried a number of World's Series passengers from the West and Southwest.

54,835 Passengers Carried in August

SCHEDULED AIRLINES carried 54,835 passengers in August, 1934, according to the Bureau of Air Commerce, Department of Commerce. Twenty-three of the twenty-four companies operating during that month submitted reports.

Those lines flew 4,188,529 miles, carried 190,440 pounds of express, and flew 21,357,741 passenger miles during August compared with 4,117,542 miles, 163,342 pounds of express and 18,152,700 passenger miles for the preceding month.

South Bend Service Resumed

AIR TRANSPORT service at the South Bend, Ind., municipal airport was resumed October 15, after a suspension of several weeks to permit completion of longer runways.

Daily mail and passenger service is given by American Airlines, on its Chicago-Detroit route, with through mail connections from South Bend to New York. Arrangements have been made with other lines for flag stops for passengers. Traffic representatives of TWA have been making a survey of the area, with the possible determination to swing part of its service north to include the city of South Bend.

• A TYPICAL TESTIMONIAL: "I send you herewith, properly executed, our fourth contract for services of THE VOICE OF THE SKY.

"We have found that the services of THE VOICE OF THE SKY give us an excellent, spectacular method of advertising our product; and this must be obvious from the fact that this is the fourth contract* we have given you in less than a year."

(Signed) L. E. BOOTH, GOLD DUST CORPORATION

* 800 *cities covered for this advertiser.*

FOR SALE — *at your price* — complete or by unit:
The equipment and operating rights of "Voice of the Sky"
Modern Aerial Advertising Medium

"Voice of the Sky" + Neon Signs = New and powerful force in selling

• WHAT IT IS: This dynamic advertising and publicity medium, most effective and spectacular yet devised, used by prominent national and local advertisers, has proved time and again its novel profit-producing powers. It broadcasts the advertiser's message verbally and, at night, also flashes his story in powerful Neon lights (visible and audible from an altitude of 3,000 feet), covering twelve square miles in only one hour, reaching economically the greatest possible number of people in the shortest known time. The entire Metropolitan New York area (which includes all cities and towns within a radius of 50 miles of Manhattan) can be covered in 100 hours.

Among the many companies who have utilized "Voice of the Sky" and the Neon signs, to mention only a few, are: Anheuser-Busch, Pabst, Old Golds, Bosch Radio, Vacuum Oil, Gold Dust, Stetson Hats, Wings Cigarettes, Standard Oil of California, Noxzema, Coca-Cola, various political campaigns, automobile dealers, department stores, etc. The Pure Oil Company recently added two "Voice of the Sky" broadcasting planes, equipped by the Plane Speaker Corporation, to their extensive advertising facilities and report gratifying successes in their numerous sales areas.

The plane can be operated with full crew and complete equipment at a remarkably low cost per hour.

• EQUIPMENT: The equipment which we offer for sale—in separate units or complete—consists of the following: The rights to operate in the United States under the Plane Speaker Corporation's rigid patents; a Keystone tri-motored plane with two Wright J-5's and a Pratt & Whitney Wasp—both plane and engines recently overhauled and in excellent condition; a number of Neon letters, tubing and generators; broadcasting unit (largest and of highest volume rating ever built). The Keystone's lower wing, especially built for the purpose, will accommodate two Neon signs of 17 letters each, each letter 6′ x 4′. This equipment is complete and ready to operate—for a manufacturer to advertise his own product, or for some organization to conduct an aerial advertising business. The Plane Speaker Corporation also will license others to operate in Canada with this or with Canadian-built equipment; or will build smaller equipment for any who wish to utilize their own aircraft.

• COST AND SALE PRICE: This complete equipment, including the Keystone, engineering and manufacturing costs of "Voice of the Sky" apparatus, Neon signs, etc., cannot be duplicated for less than $139,000. ***We will sell it for the highest offer —regardless of what it is.***

We also will sell the Keystone Trimotor without the apparatus, or the apparatus without the Keystone. This equipment, incidentally, can be installed in practically any six-place cabin plane.

All logical inquiries will be answered promptly. Thorough investigation invited

PLANE SPEAKER CORPORATION

295 Madison Avenue, New York, N. Y.

Vought Memorial Established at N.Y.U.

HAROLD O. VOORHIS, secretary of New York University, has received a gift of $1,000 from Mrs. Annie E. Vought, Forest Hills, N. Y., as a memorial to her son, the late Chance Vought. Income from the gift will be used to establish an appropriate prize in the Daniel Guggenheim School of Aeronautics which will be awarded annually to the senior or graduate student in aeronautical engineering who produces the best design for an airplane of given specifications. The award will be known as the Chance Vought Airplane Design Prize. The students work independently and under design office conditions.

Dr. Alexander Klemin, professor-in-charge of the School of Aeronautics and one of the technical editors of AERO DIGEST, declared "A Chance Vought prize in design would be a fitting memorial to the great ability of that pioneer and would stimulate the work of all aeronautical students."

Mr. Vought, who died in 1930, was an alumnus of the New York University College of Engineering.

New Courses Offered by Stewart

STEWART TECHNICAL Trade School, New York, is offering a Master Mechanics Course and an Aeronautical Engineering Course. The curriculum for each course is extensive, covering airplane design, manufacture, operation and maintenance. The courses, complete in every respect, consist of both technical and practical training. Engine testing under actual flight conditions is featured on an extensive scale.

South Bend Schools Active

AVIATION INTEREST in the public high schools in South Bend, Ind., has embraced such a large proportion of the school membership that it has been necessary to divide the high school Aero Club into five sections. Supervised by engineers, the courses will provide study and practical work in navigation, model building, propeller and engine construction.

Parks Enrollment Increases

STUDENT ENROLLMENT at Parks Air College, East St. Louis, Ill., for the Fall term almost doubles that of the corresponding term of 1933. The present total enrollment is 194, including 105 new students, compared to a total of 107 registered students and 30 new students last year.

Enrollment in the major courses is: Executive transport pilots 22; aeronautical engineering 44, and master mechanics 62. There are 43 enrolled in the airplane and engine mechanics' course.

Construction has started on a third dormitory to be of brick and steel and air conditioned. The structure, one story high, will accommodate 72 students and be ready for occupancy Jan. 1, 1935. The three dormitories will provide residence facilities for 242 students.

MINNESOTA GROUP GETS LOENING AWARD

THE UNIVERSITY of Minnesota Flying club has been awarded the Loening Trophy for accumulating more flying hours than any intercollegiate flying club in the country. The club, composed of about 40 members, plans the incorporation of a national association with about 40 chapters in various colleges and universities of the United States, aiming to foster collegiate aviation, to co-ordinate flying activities and to promote aeronautical educational activities.

Spartan Registration Increases

ENROLLMENTS AT the Spartan School of Aeronautics, Tulsa, Okla., have increased 80 per cent, and from indications another record enrollment will have been reached late this month.

Members of the Dawn Patrol recently flew to Paris, Tex., to assist in the opening dedication program of a new stretch of highway and another flight is being planned for the early part of this month when a number of students will be guests of the Gainesville, Tex., Chamber of Commerce.

The most popular course is the Master Mechanic Flight Course, which has 25 per cent of the total enrollment.

Another popular course is the Special Transport Course, which is gaining in popularity and gives promise to soon outrival the Master Mechanic Flight Course.

School Leases Space to Hanford

NORTHLAND AVIATION School, Wold-Chamberlain Field, Minneapolis Municipal Airport, has leased to Hanford Tri State Airlines, space for shops and offices in the school hangars. Under the arrangement, the airline will use the space as an operations base. The former base was temporarily located at Holman Field, St. Paul, with the overhaul shops at Rickenbacker Airport, Sioux City, Iowa. All shops will now be located in the Northland hangars, as will the radio department and executive offices.

The new arrangement provides students with an opportunity to observe, first-hand, the operations of a major airline, and advanced students will work as apprentices in the Hanford shops.

Fifty New Students at Boeing

THE BEGINNING of the fall term at the Boeing School of Aeronautics, Oakland, Calif., saw fifty new students enrolled for aeronautical training courses.

The students came from 21 states in the Union and from one foreign country, some enrolling for the 250-hour flight instruction course and others for the one- or two-year mechanics courses.

Specialized training, leading toward possible semi-technical and administrative positions, is featured in the new two-year curriculum known as the Airline Operations Course. Representing the most complete training in ground school offered by the institution, the course prepares its graduates for employment in either the various department of airlines or in aircraft factories.

The first year, 1692 hours is devoted to airline mechanics instruction; the second year, 1680 hours is concentrated upon training for certificates in field service, airplane metal, aircraft engines, radio electrician and operator, instrument service and applied design.

New Students at Ryan

SEVEN NEW students are now taking courses for the fall and winter semester at the Ryan School of Aeronautics, San Diego, Calif. They are specializing in flight and mechanical work.

The school has had its Department of Commerce certificate renewed. It is licensed to instruct in transport, limited commercial, private and amateur flight and ground courses.

Jones School Increases Faculty

CASEY JONES School of Aeronautics, Newark, N. J., has added to its faculty, Henry H. Hall, Assistant Engine Instructor and Joseph Harrison who is conducting courses in Aviation Law. Hall attended the University of Florida and Tulane University, and spent the last three years at the Air Corps major overhaul station in the Hawaiian Islands. Harrison is a member of the New Jersey Bar, and during the last year clarified and coordinated certain state laws pertaining to aviation.

The schools reports an enrollment of 265 students.

Eaton Opens Gliding School

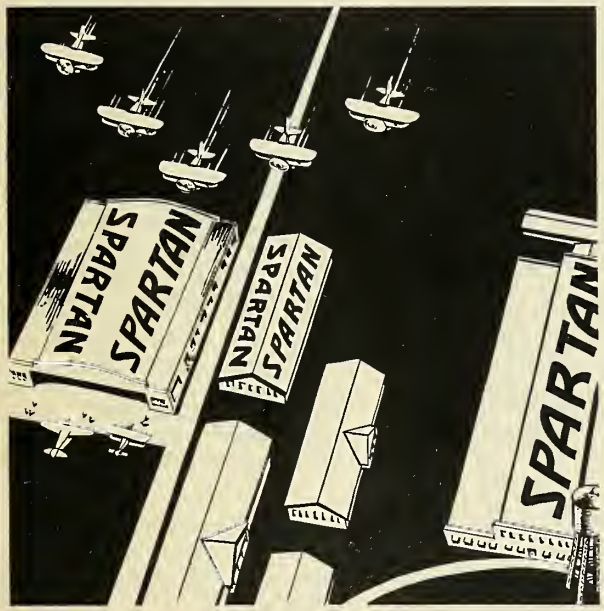
A SCHOOL for gliding and soaring instruction and training has been opened at Caton Avenue Airport, Elmira, N. Y., by Warren E. Eaton, president of Central New York Airways, Inc.

Two Franklins are available for training purposes and A, B and C licenses will be issued according to the requirements of the National Aeronautic Association.

The Million Dollar SCHOOL OF AERONAUTICS

The Spartan School of Aeronautics is dedicated to the training of young men and women for definite places of leadership in the great aeronautical industry. With this goal ever before us we have invested over a MILLION DOLLARS to make the name Spartan pre-eminent in aeronautics and the country's outstanding flying school.

Here at Spartan each phase of instruction is carefully scheduled as part of the course taken. Each division of instruction follows in logical sequence and flying accompanies ground school in such manner that the student thoroughly grasps the fundamentals of each.



SPARTAN SCHOOL OF AERONAUTICS

MUNICIPAL AIRPORT, TULSA, OKLAHOMA

As a result of such careful instruction Spartan Students complete their courses months before students in other flying schools, with the consequent saving in living expenses and the opportunity to actively enter the Industry much in advance of the time formerly taken.

Tomorrow Aviation promises to become one of America's FIRST Industries. YOU can occupy a key position in this great Industry if you are properly trained today! Send for a copy of the new Spartan Catalog, over 50 pages describing in detail SPARTAN 3 ★★★ STAR Courses of Aeronautics, giving prices and complete detailed costs of expenses while at the School. A FREE copy is waiting for you, send the coupon below today!

FLY WITH THE DAWN PATROL

MAIL THIS COUPON TODAY FOR YOUR FREE COPY OF THE SPARTAN CATALOG

SPARTAN SCHOOL OF AERONAUTICS
P. O. BOX 2649, TULSA, OKLAHOMA

GENTLEMEN: Send me a copy of the NEW 1934 Spartan Catalog and Supplement describing in detail Spartan 3☆☆☆ STAR Courses of Aeronautics, tuition prices and detailed living expenses:

NAME_____

ADDRESS_____

CITY_____ **STATE**_____

AGE____ **Any Previous Flying Experience?**_____

Check below branch of aeronautics you are most interested in:

- ☐ FLYING
- ☐ MECHANICAL
- ☐ RADIO-INSTRUMENT
- ☐ EXECUTIVE-MANAGEMENT

AT THE AIRPORTS

Bendix Airport Reorganized

REORGANIZATION OF the operation of the Bendix municipal airport at South Bend, Ind., has been effected, under direction of the new city aviation commission. Vincent Bendix has given a new lease to the city, under which it will control the port until 1938, with an option to purchase the 400-acre tract for $250,000.

Operation of the airport has been placed under Homer Stockert, manager of Stockert Flying Service, and Capt. Rudolph Van Devere, manager of Indiana Flying Service. They will alternate in monthly supervision and control of port activities.

The price of gasoline has been fixed to yield the airport a profit of 4 cents per gallon. On the average monthly sale of 5,000 gallons, the aviation commission expects an operating profit of $200; if sales increase sufficiently to produce excess revenues, the price will be decreased.

Lake Delton Runway Completed

R. M. HINES, manager of Heart of the Lakes Airways, Inc., Airport, Lake Delton, Wisc., announced the completion of the first of the three runways now being improved.

The NW-SE runway, 300 × 2600 ft., is available and the two other runways will be completed in the near future.

The large brick and wood hangar is being modernized and a repair shop and a complete stock of parts is being carried for all types of engines and ships.

Airport in Athens Dedicated

THE 30-ACRE airport at Athens, Ohio, was dedicated recently with a program that included stunt flying and parachute jumping. About 1000 stamp collectors, aviators and aviation enthusiasts throughout the United States sent stamped envelopes to the Athens postmaster for a special cachet commemorating the occasion.

Mississippi Cities Get Port Funds

FUNDS HAVE been made available for the construction of new airports at Laurel, Meridian, Richton, Carthage, Philadelphia, McComb, Hazelhurst, Picayune, Amory, Magee, Biloxi, Gulfport and Pascagoula in the state of Mississippi. Some of these already have temporary airports, made available by CWA labor last year.

YOUNGSTOWN OFFICIALS MAY REBUILD PORT

CITY OFFICIALS of Youngstown, Ohio, are again studying the possibilities of rehabilitating the Municipal Airport, following the offer of Central Air Lines to resume mail service there if proper landing facilities are provided.

Welcome New Planes in Salt Lake

SALT LAKE City airport celebrated inauguration of the use of new Douglas transports by General Air Lines between Salt Lake City and Los Angeles by featuring a program to which business men from Los Angeles and Las Vegas, Nevada, were invited. Alfred Frank, of the Alfred Frank Airways, acted as chairman.

Lambert Field Improved

NEW IMPROVEMENTS at Lambert Field, St. Louis muncipal airport, include a concrete road extension, new fencing and installation of steam heat facilities in the U. S. Weather Bureau building.

The new road, 16 feet wide and 650 feet long, and replacing a dirt road, is an extension of the main drive skirting the airline and plane service buildings.

A Page chain link eight-foot fence was installed along the new highway, and steam heat and hot water facilities for the Weather Bureau will be furnished through a pipeline from the Terminal Building.

Two Operators Organize

THE GALVESTON, Texas, Flying Service has been incorporated for a general passenger service. Incorporators are K. C. Fairchild, M. Leonard, and W. E. Huddleston.

Another new company was formed in Vandalia, Ohio, when Mayes Aviation, Inc., was incorporated by R. K. Powell, E. Breisch, and C. Finkle. Capitalization was set at $20,000.

Peat To Operate Butler Airport

OPERATION OF Butler airport, Pittsburgh, Pa., has been taken over from the Pittsburgh Aviation Industries, by D. Barr Peat, who will operate the field under the name of Barr Peat Airports Co., of which he is president.

The arrival of the State Air Tour on October 14, and the dedication of the new Pittsburgh-Butler highway, which brings the field within 35 minutes of downtown Pittsburgh, were the first events at the field under the new management.

Peat will confine his activities at Butler to the promotion of private flying, servicing and instruction.

Butler airport consists of two hangars and 640 acres, of which 600 are now available for landing. It provides space for activities of country clubs, aviation clubs, repair and service depots and storage of private planes. It was developed by the Pittsburgh Aviation Industries Corporation at a cost of about $500,000.

Operator Moves To Tucson

PARAMOUNT AIR Service, Inc., formerly of San Francisco, Cal., resumed operations under the name of G & G Gilpin Airlines, Ltd., with headquarters at the Municipal Airport, Tucson, Arizona. Heinz Wegner is manager.

The company has a modern school using Fleet training planes and is also offering a charter flight service in a Bach airliner.

Glendale Barbeque Popular

SEVERAL HUNDRED airplane owners and pilots attended the recent barbeque at the Grand Central Air Terminal, Glendale, Calif., with Major C. C. Moseley, managing director of the terminal, acting as official host.

Moseley arranged to provide the visiting planes with gasoline and also saw that each of his guests was amply supplied with barbequed beef, draught beer and trimmings.

Operator Adds Equipment

WITH THE completion of construction work on the Lake Delton, Wis., airport which increased the size of the field, Heart of the Lakes Airway, Inc., has added to its fleet of ships a two-place Aeronca.

Operator Offers Extensive Service

PORTLAND AIR Service, Inc., has been organized in Portland, Ore., with James Lester Meadows as president; M. H. Jones, vice-president; and Stewart Weiss, secretary. This firm is an outgrowth of the Rasmussen-Meadows Co., operators at Swan Island Airport, Portland. Personnel is the same as the company which it supplants, using its equipment, shops and administration offices.

A number of flying functions are embraced in the new corporation, while the Rasmussen-Meadows Co., remains the same in Seattle, Wash. Enlarged scope of the organization includes air taxi service, charter trips, airplane ambulance service, as well as aerial mapping and photography.

The air taxi service is believed to be highly practicable at this time and ambulance service was also felt to be a growing necessity.

Present shops of the organization are now undergoing enlargement as well as remodeling and facilities will be added to meet new features of the organization.

Two Operators Get Approval

APPROVED REPAIR station certificates have been issued by the Bureau of Air Commerce, Department of Commerce to two fixed base operators as follows:

Western Flying Service, Inc., Denver, Colo., approved for welded steel tube structure, excluding fittings, wood structure, excluding box and laminated spars, fabric covering, steel fittings and assembly.

Fitzgerald Bros., Aircraft Service, Dycer Airport, Los Angeles, Calif., approved for welded steel tube structures, excluding fittings, wood structure, excluding box and laminated spars, steel fittings and assembly.

Lighting System Installed

WORK HAS begun upon installation of new lights at the Rock Springs, Wyo., municipal airport. The field is being enlarged under ERA funds, more than $50,000 having been expended by the government since February 1 on the project.

United Air Lines, through co-operation with the city, is carrying out the lighting program, which, when completed will encompass the entire field. The latest type boundary and obstruction lights will be used.

Utica Airport Progressing

WORK OF improving the Utica, N. Y. Municipal Airport is progressing rapidly, according to Reginald I. Heath, superintendent.

Workers have enough to do to keep them busy until winter he said, and the question as to whether the project will be extended to keep the port open at all times after snow falls will be decided later. Grading of the field has been the principal work, and it is reported to be in excellent condition.

Regular stops are made twice daily in both directions by American Airlines.

City Comptroller Richard G. Williams reports that on October 1, $5,465.60 was still available of the year's $11,374.68 budget for 1934 operation of the field.

SEAPLANE BASE TO BE BUILT AT NEWARK

OFFICIALS OF the city of Newark, N. J., have announced plans for a seaplane base at the Port of Newark, adjacent to Newark Airport, where part of the shipways of the old Submarine Boat Corp., will be utilized. It is expected construction will require about three weeks.

Utah Airport Work Gains

MONEY COLLECTED from airplane gasoline taxes may be spent to develop Utah airports, if recommendations to the next state legislature by Preston G. Peterson, road commission chairman, are adopted. The airport development plan is gaining in favor in the state.

Work on the new hangar at the Carbon county airport at Price is progressing rapidly and will soon be completed. Steel doors for the hangar have been ordered and the roofing is well under way. The structure will house planes belonging to J. R. Lund, George Schultz and others who base on the field.

Preston Airport Improved

PRESTON AIRPORT has been considerably improved, and A. C. Blomgren, state Director of Aeronautics, said that it is one of the best in Idaho. The location is ideal, having no trees or high tension wires near it, and is only two miles west of town on Highway 91.

New Company In Dallas

AIRPLANE EQUIPMENT & Sales Corp., of Dallas has been granted incorporation papers to conduct an airplane and equipment enterprise. Capital stock was listed at $1000 while incorporators are William L. Campbell, Lois M. Campbell and M. L. Stewart.

Fort Worth Plans Improvements

THE CITY COUNCIL of Fort Worth, Tex., has indorsed a huge bond proposal to raise funds for an extensive city improvement program which includes a combination air passenger terminal building for Meacham Field, the municipal airport. In addition, field and landing lights will also be installed.

New Army Unit Organized

A GENERAL Headquarters Air Force, consisting of 48 squadrons situated in six states, with headquarters at Langley Field, has been formed in the U. S. Army Air Corps.

The new force will be under the immediate direction of General Douglas MacArthur, Chief of Staff, with actual command of the division under an as yet unnamed officer, probably Colonel Charles H. Danforth. Centralization of command of the air force under the chief of staff, greatly limits the authority of Major General Benjamin D. Foulois, Chief of the Air Corps, who only retains charge of air corps schools, depots and procurement.

The official announcement did not specify the number of planes in the squadrons, but the General Staff, in recommending creation of an independent air force, designated it as a unit of at least 900 planes. Those units designated comprise virtually the entire combat strength of the Army Air Corps.

The plan is to divide the new unit into five "wings," with bombardment and pursuit units based on the Atlantic and Pacific coasts and attack units in the middle west, to provide the greatest mobility. Each wing is to have about 200 planes. It is also planned to bring each of the 48 squadrons up to full peacetime strength and to organize about 15 new units.

Combat units at the following fields will be incorporated in the new air force: March Field, Riverside, Calif.; Hamilton Field, San Rafael, Calif.; Rockwell Field, San Diego, Calif.; Langley Field, Va.; Fort Crockett, Galveston, Texas; Barksdale Field, Shreveport, La.; Selfridge Field, Mt. Clements, Mich.; and Scott Field, Belleville, Ill.

Army Fields to Be Improved

ESTIMATES FOR new construction at Kelly, Brooks and Duncan Fields, U. S. Army Air Corps centers in San Antonio, Tex., costing about $11,000,000 have been approved, according to Major General Johnson Hagood, commander of the 8th Corps Area.

The plans include an expenditure of $5,438,000 for converting Kelly Field into a permanent project, replacing wooden structures with modern buildings similar to those at Randolph Field; about $3,835,000 for doing the same at Brooks Field; and $1,803,000 for expansion of San Antonio Air Depot at Duncan Field.

The War Department has definitely decided to maintain the primary school at Randolph Field and the advanced school at Kelly Field as separate units, instead of combining them as had been proposed as an economy measure.

AIR BASES TO BE BUILT AT STRATEGIC POINTS

PLANS FOR establishing strategic air bases on the East and West Coasts are being studied by the War Department. The General Staff is considering at least 10 new depots reaching from Maine to Florida, along the southern border and up from California to Alaska.

Centner Gets Reserve Post

MAJ. WILLIAM F. CENTNER, superintendent of Port Columbus, Ohio, has been elected president of the Air Reserve Association of the Fifth Military Corps Area. Lieut. N. L. Goldsmith, Louisville, Ky., is vice-president.

A national meeting of the organization, which includes members from Ohio, Kentucky, Indiana and West Virginia was held at Port Columbus in October with Maj. Centner in charge of the program.

West Pointers to Take Air Course

AN AERIAL experience course of 20 hours has been ordered for all West Point Cadets in the first and third classes, following a recommendation of the War Department's special committee on the Air Corps.

The proposed course, to begin next summer at Mitchel Field, Mineola, N. Y., will include: familiarization flights to accustom cadets to being in the air, flights to gain experience in bombing, aerial observation, use of weapons, etc.

Ground instruction, taken during the flight training period, will include use of aerial maps, bomb sights and releases, camera obscura, preparation of observer's reports, manipulation of aircraft machine guns and the solution of elementary problems in aviation.

Distance Flights for Navy Planes

NAVAL AIRCRAFT squadrons based at Coco Solo, Canal Zone and Pearl Harbor, Hawaii are scheduled to make long-distance flights during the winter and spring, according to Capt. John H. Hoover, chief of staff to Rear Admiral A. W. Johnson, commanding aircraft, San Diego, Calif.

Three squadrons from the Canal Zone will circle the Caribbean Sea in January, and four other squadrons will make a tour of the Hawaiian Islands.

Utah Units Join In Exercises

ANNUAL AIRCRAFT maneuvers were completed at Fort Douglas when the 38th Infantry and 329th Observation Squadron joined in simulating war conditions. All types of communications between ground and air forces were tried out during the exercises. Colonel A. F. Dannemiller was director of activities with Major W. P. Scobey in charge of training work.

Device Tests Piloting Ability

DR. L. J. O'ROURKE, Director of Research in Personnel and Administration of the United States Civil Service Commission, has designed for use in Army air schools a device which aids in forecasting whether or not a candidate for flight training will be likely to qualify. The apparatus, known as the complex coordinator, was built at the Bureau of Standards from Dr. O'Rourke's design, who at the request of Army air officers as a function of the Civil Service Commission's research in the selection of personnel for the Government, undertook the project.

The device has been tried at Brooks Field, Texas, and reports show a striking relation between those who make high scores in the test and those who graduate as fliers. The same marked relation is shown between those who make low scores and those who fail in the training for fliers.

The promptness with which the person undergoing the test reacts to the signals given by the lights and buzzer is recorded automatically by a chronoscope. Not only is the time recorded in hundredths of a second, but the chronoscope also makes a record of the errors made by the person being tested.

U. S. NAVY TRAINING PLANE DESIGN COMPETITION

Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a.m., February 12, 1935, for setting forth designs and prices for one hundred and fifty (or less) Navy training airplanes, together with two hundred (or less) float type landing gears. For detailed information, apply to the Bureau of Supplies and Accounts. C. J. PEOPLES, Paymaster General of the Navy.

PRIVATE FLYING and CLUB NEWS

Aviators Show November 10

THE SIXTEENTH Annual Aviator's Armistice Dinner and Show will be held at the Hotel Ritz-Carlton, New York on the evening of November 10. Sponsored by the Aviators Post of the American Legion, the affair is being made possible through the cooperation of members of other flying organizations in the metropolitan area including the 27th Division National Guard, Air Corps Reserve Association, Aviation Country Club, Amateur Pilots Association and the Naval Air Reserve.

Among those contributing, by writing or acting, are Clarence Chamberlin, Frank Hawks, Frank Courtney, Fred Stone, Cy Caldwell, Frank Godwin, Bob Lyons, Lt. Col. George Vaughn, Roger Q. Williams, Roger Kahn, Casey Jones, Elliott White Springs, Clayton Knight, Clark Robinson, Sam Moore and Major Lawrence Brower. The show will consist of a number of acts of an aviation character, with Fred Stone, assisting in its direction.

von Schrenk Heads A.S.T.M.

DR. HERMANN von Schrenk of St. Louis, Mo., was elected president of the American Society for Testing Materials, following action taken by the Executive Committee to fill the vacancy caused by the death of W. H. Bassett.

A vacancy created by Dr. von Schrenk's election was filled by the appointment of H. S. Vassar, as senior vice-president, Mr. Vassar having been elected a vice-president last June. A. C. Fieldner was elected junior vice-president.

Helen McCloskey Wins Race

A CROWD of aviation enthusiasts attended the All-Women Air Show staged at College Park airport, College Park, Md.

Helen McCloskey won the 25-mile handicap feature race, nosing out Edna Gardner, in a finish which thrilled the spectators. Genevieve Savage, of Washington, was third. The event was sponsored by the Washington (D. C.) Women Pilots' Association, of which Miss Savage is president.

Cox Wins Tour Award

THE ANNUAL trophy award in the recent Indiana all-state air tour, for "common sense, judgment, attitude toward rules and regulations, and fine regard for the welfare of other ships on the tour," was awarded to Major Charles E. Cox, Jr., manager of the Indianapolis municipal airport, by the Lincoln National Life Insurance Co.

Treasure Hunt at Holmes Airport

AN AIRPLANE treasure hunt, competing for cash prizes awarded by Mrs. I. J. Fox will be held November 11, from Holmes Airport, Jackson Heights, N. Y. All licensed ships are eligible.

Entrants will seek various "treasures" on designated airports within a 30-mile radius of Holmes Airport. Each will receive sealed orders as to where to proceed and what to obtain. Upon completition of the first objective, the contestant will receive further orders as to the next objective until the return to Holmes is ordered.

Arkansas Holds Seventh Tour

A TWO-DAY tour of new airports in the state of Arkansas featured the seventh annual event under the general chairmanship of Charles M. Taylor of Little Rock. From 20 to 25 planes participated, stopping at ten airports, seven of which were recently constructed. The other three have been materially improved.

The planes started from Little Rock and stopped at Ola, Russellville, Clarksville, Ozark, Fayetteville, Siloam Springs, Fort Smith, DeQueen, Texarkana and Arkadelphia before returning to the original take-off point.

Included in the entries were three ships from the 154th Observation Squadron of the Arkansas National Guard.

F.A.I. Meets in Washington

THE THIRTY-FOURTH conference of the Federation Aeronautique Internationale and the first ever held in this country, officially opened in Washington, October 9, inaugurating four days of work dealing with sporting aviation.

Upon his arrival in New York and before leaving for the conference in Washington, Louis Bleriot was inducted into the Early Birds organization at a dinner sponsored by AERO DIGEST in the Waldorf-Astoria Hotel. In addition to the members of the F.A.I., and the Early Birds, many men of the present day industry gathered there to honor the man who flew the English Channel in 1909.

Representatives from 22 of the 34 member nations, headed by Prince Bibesco, president of the F.A.I., came to the conference. In the list of those present were such illustrious names as Paul Tissandier of France; Marcello Diaz Ducca della Victoria and Lt. Col. Paul Sbernadori of Italy; Wolfgang von Gronau of Germany; Major C. J. W. Darwin of Great Britain and Jonkheer van der Berch von Heemstedt of Holland.

Following a visit to the site of the Wright Brothers first flights at Kitty Hawk, N. C., the delegates were officially welcomed by Secretary of State Hull, Secretary of Commerce Roper and other high government officials. The gold medal of the association was then presented to Wiley Post.

The convention ended with the re-election of Prince Bibesco as president. Tadiya Sondermeyer of Yugoslavia was named to succeed General Amundson of Sweden, who resigned and von Gronau was added to the general council. It was decided to hold the 1935 convention in Belgrade, Yugoslavia and to admit the Aero Club of Bulgaria into membership. The applications of the Aero Clubs of Moscow and Ireland were temporarily tabled.

The federation was advised it would act as the League of Nations authority on all international air problems.

Acme photo

Group of foreign delegates to the Federation Aeronautique Internationale conference upon their arrival in New York

Fixed Base Operators Busier

MISCELLANEOUS OPERATORS carried 571,693 passengers and flew 36,780,157 miles during the first six months of 1934, according to the Bureau of Air Commerce. Miscellaneous operations include commercial services, pleasure flying, instruction of students and experimental flying. Scheduled air transport activities, which are not included under this category, accounted for 241,772 passengers and 21,517,658 miles during the same period.

Compared with operations during the similar period in 1933, the miscellaneous operators showed increases in both listings. In 1933, January-June, 32,748,157 miles were flown and 434,586 passengers carried.

Hammond Wins Aircraft Contract

A CONTRACT for a new-type civil airplane, designed with emphasis upon safety and ease of operation, has been awarded by the Bureau of Air Commerce of the Department of Commerce to Hammond Aircraft Corp., Ypsilanti, Mich. Fifteen to twenty of the airplanes will be purchased and assigned to the Department's aeronautical inspectors for use in the field.

Originally planning to purchase 25 airplanes, the Bureau reduced the number to 15, with the option of taking five more, so that a portion of the funds originally set aside will be available for experimenting with other types brought forward in the competition. Several of these, although promising, did not fully meet the specifications.

A distinctive feature of the Hammond pusher-type monoplane model is its three-wheeled undercarriage, which permits the airplane to be landed at low or high speed and then brought to a quick stop by immediate and full application of the brakes. A 95 horsepower Menasco will be used.

The specifications to which the airplanes will be constructed call for ability to land and take off from an unusually small field, a low speed of 35 miles per hour and a high speed of 110 miles per hour. The planes will cost $3,190 each.

The first airplane manufactured under this project is to be delivered for acceptance at the manufacturer's plant within five months after receipt of order. The remaining planes shall be delivered within four months after acceptance by the Government of the first ship.

The Hammond monoplane will be constructed entirely of metal and will accommodate two persons seated side-by-side. Provision is made for 40 lbs. of baggage.

NATIONAL AIR RACES SHOW $12,157 PROFIT

THE 1934 National Air Races, held in Cleveland, made a profit of at least $12,157, according to preliminary figures, marking the first time since 1929 that the event has been able to show a profit. Income from tickets, concessions, programs, sponsorships, etc., amounted to $241,370.49, while expenses for prizes, operations, construction, and general and administrative expenses amounted to $229,213.07, leaving a profit of $12,157.42.

New Stinson Delivered in Canada

A STINSON Reliant designed for freight carrying as well as for passenger work, has been delivered to General Airways, Ltd., of Toronto, Canada, which maintains bases at Rouyn, Hudson, Amos and other northern outposts on the railheads. During the past five years the company has carried thousands of tons of freight and thousands of passengers from the railheads to mines located in the interior.

The Stinson has one front seat and two quickly - removable rear hammock - type seats and its lower side walls and the floor are metal-covered.

It operates on Edo floats in the summer, while during the winter season it will be equipped with skis.

Because of severe weather conditions, two hinged doors were constructed in the bottom of the N.A.C.A. cowling so that heat might quickly pass over the engine as it is being warmed up.

The plane is powered with a Lycoming engine driving a Lycoming-Smith controllable-pitch propeller and is equipped with wing flaps.

Model of 95 h.p. Menasco-powered Hammond all-metal monoplane

Commercial Production Up

A SHARP upward swing has been shown all year, with the exception of a slight retrogression in April, in commercial production and deliveries according to a report of the Aeronautical Chamber of Commerce. The July production of commercial airplanes was up 8.2% and deliveries were up 15.1% as compared with June, each being almost 50% of the total production and delivery figures, respectively, for the first six months of 1934. Production of commercial engines in July was greater than any previous month this year with the exception of March, and was 23.4% higher than June. A new monthly high for the year was reached in deliveries of commercial engines, which were up 46.5% from June.

Military production and deliveries of airplanes were both up 23.8% from June, but engines were down to less than one-half the June figures. The total of military engines and airplanes showed a steady downward trend the first quarter of this year, but in May and June there was a sharp pick-up.

Sales of spare parts were up in July as compared with June, for commercial, and down for military airplanes and engines.

Unit values of airplanes, both military and commercial, show an upward trend for the year, but those for engines show no definite trend. No new floats, either commercial or military, were reported as produced and sold during July.

A total of 297 commercial and 241 military planes were produced during the first six months of 1934 while 197 commercial and 64 military engines were produced during the same period. Deliveries during the same period for aircraft were 291 commercial and 241 military and for engines, 1023 commercial and 340 military. The value of aircraft delivered was $9,716,426 for commercial and $7,767,363 for military.

Ailor Sells 13 Planes in Week

A RECORD for Waco Sales of New York, eastern distribution headquarters for Waco Airplane Co., was set one week recently when thirteen planes, new and used, were sold, according to Howard Ailor, president of the company which is located at Roosevelt Field, Garden City, New York.

Among the planes sold was a Jacobs-powered Waco cabin to Wm. A. Hughes of Newark, N. J.; J. H. Lapham, Wright-powered Waco cabin; Horace Barnes, Lumberton, N. C., Continental-powered Waco cabin; Jack Goldberg, Waco F; Wright-powered Robin to A. J. Bowman and a Waco F-2 to Henry Carter of Maxton, N. C.

The company has just bought a new Jacobs cabin and a new F-3.

Lockheed Names New Superintendent

RICHARD VON HAKE has been named factory superintendent of Lockheed Aircraft Corp., Burbank, Calif., succeeding Otto Santoff, who has been placed in charge of customer-service. von Hake was chief engineer of the Lockheed company under the previous management.

Another change in the shop personnel has been the appointment of E. Morton Bach as foreman of the Electra final assembly department.

Aerovias Centrales Secures Electra

FOR EARLY inauguration of multi-motor air service between Los Angeles and Mexico City, Pan American Airways has taken delivery of the first of six all-metal, Lockheed Electras ordered for Aerovias Centrales, S. A., its affiliate.

Powered with two P. & W. Wasp SC-1 engines, Pan American's Electra is a new model 10C. Previously completed Electras have been of the 10A model powered with Wasp Juniors. An improvement in the new Electra is the installation of a streamline-type windshield which slopes backward, in place of an earlier type of shield which sloped forward.

Northwest Airlines, St. Paul, has taken delivery of its fourth Electra, Wasp Junior-powered, for its northern transcontinental service, and Herbert G. Fales, sportsman pilot and official of the International Nickel Company of Canada, has taken delivery of a Wasp-powered Vega.

Fales will base the Vega at a New York City airport, where he also maintains a Stearman sport plane. Paul Mantz, well known Pacific Coast pilot, flew the Fales ship from Los Angeles to New York in 14 hours, and took Amelia Earhart's transatlantic Vega back to Burbank for an overhaul.

Airplane Inspector Shifted

FORREST H. LONGEWAY, Department of Commerce aeronautical inspector has been transferred by the Bureau of Air Commerce from Minneapolis to Milwaukee where he will headquarter at the county airport. His territory includes Milwaukee, Madison, Oshkosh and St. Ignace, Wisc. and Rockford, Ill.

August Exports Total $2,787,878

AMERICAN AERONAUTICAL exports experienced the finest month in a year during August, 1934, when sales to foreign purchasers reached a total valuation of $2,787,878. The greater part, $1,680,330, was for 107 airplanes while 77 engines brought $462,025.

Colombian buyers again were among our best customers, leading with purchases of $668,068 for 49 airplanes and almost $100,000 worth of parts and accessories. China continued to take a good portion of American products when $658,830 was spent for 19 airplanes and $93,355 for parts and accessories. Next among the largest purchasers was Russia which spent $450,460; Siam, which spent $251,628; Peru, $166,390 and Germany, $156,099.

Aircraft were also purchased by the following countries: Mexico (9), Brazil (3), Nicaragua (2), Argentina (2) and one each by Czechoslovakia, France, Italy, Chile, Philippine Islands, Australia and the Union of South Africa.

(*Continued on following page*)

Digest of Recent Events

Poland Again Wins Bennett Cup Race

THE ANNUAL Gordon Bennett Balloon Races again were won by Polish balloonists who not only took first place, but also managed to win the next two places in the twenty-second annual contest held at Warsaw, Poland. Z. Burznski and J. Zakrzewski, landing near Riazan, Russia covered approximately 750 miles; Capt. Franciszek Hynek landed near Voronezh, Russia while third place was taken by the *Polonja,* which came down in a lake some 200 miles north of Helsingfors, Finland. Sixth place fell to the U. S. Navy balloon piloted by Lieutenants C. H. Kendall and H. T. Orville, who covered 620 miles. SEPT. 27

U. S. Glider Record For Altitude Broken

TWO SOARING flights in which it was said the American altitude record was broken were made by pilots of the Soaring Society of America during the ten-day meet in Big Meadows, Va. Warren Eaton and Lewin Barringer flew their soarers in formation to an altitude of about 6500 feet, comparing with the 6224-foot record set last summer by Richard duPont. Two secondary gliders, piloted by Don Bernowicz and John Novak reached an altitude of about 2000 feet. The world's record for soaring planes is 8,494 feet held by Robert Kronfeld. SEPT. 27

Youth Breaks Record On Long-Distance Hop

JAMES MELROSE, 20-year old Australian pilot, flew from Darwin, Australia to London in 8 days 9 hours, beating the former mark of 8 days 22 hours 25 minutes held by Jimmy Mollinson and that of 8 days 12 hours held by Bernard Rubin and H. F. Waller. The plane was a Puss Moth with a Gipsy engine. Melrose averaged about 1200 miles each day. He also holds the record for a flight around Australia. The England-Australia record was broken by C. W. A. Scott and T. Campbell Black who flew a twin-engined *Comet* in 71 hours to Australia. SEPT. 28

Gromoff Flies 7,707 Miles Non-Stop

A NON-STOP, non-refueling flight of 7,707 miles in about 75 hours, averaging almost 102 miles an hour was made by Commander Michael Gromoff and two others. The flight was made over a triangular course in Russia using an all-Soviet constructed plane, the RD. For his accomplishment, Gromoff was elevated to the rank of "Hero," a new rank recently created. The flight will not be officially recognized since Russia is not yet a member of the Federation Aeronautique Internationale. SEPT. 29

Italians Set Distance Mark in Seaplane

FLYING A Cant Z-501 seaplane powered by an Isotta-Franschini 750-horsepower engine, Mario Stoppani, Corradino Corrado and Amadeo Suraion flew 2561 miles between Monfalcone, near Trieste and Massaua, capital of the Italian colony of Eritrea, in Northern Africa. Their flight exceeded the last best mark by 153 miles, removing from the United States the long-distance seaplane non-stop flight record held by Lieut. Comdr. Knefler McGinnis and Comdr. Marc A. Mitschler who flew from San Francisco to the Hawaiian Islands. The flight required 26 hours 25 minutes, despite bad weather. OCT. 19

Russian Flier Loops Glider 227 Times

THE ANNUAL All-Union Glider Meet held in Koktebel, Crimea was the occasion for the establishment of a new world's record for looping a single-place glider. Pilot Bazudin made 227 consecutive loops in a four-hour flight, eclipsing by 18 the last best previous record, also held by a Russian. OCT. 19

Scott-Black Cut Record 4½ Days

BY FLYING between Mildenhall Airdrome and Melbourne in 70 hours 59 minutes 50 seconds, C. W. A. Scott and T. Campbell Black not only won the MacRobertson trophy and cash award, but also broke existing records by a wide margin. The flight took 10,394 miles and bettered the previous record held by Capt. Charles T. P. Ulm by 4 days 13 hours 12 minutes. It was the third time that Scott figured as a record-maker between England and Australia. OCT. 22

Agello Sets New Seaplane Speed Mark

FLYING THE same Macchi 72 seaplane in which he set previous speed records, Lieut. Francesco Agello, Italian pilot, attained a top speed of 440 miles an hour at Desenzano, Italy. His old mark, set last April was 423.822 m.p.h. The engine was a new Fiat AS-6V which develops 3500 h.p. In his four attempts, Agello made 438.08 m.p.h., 441.19 m.p.h., 441.81 m.p.h., and 440.67 miles per hour. OCT. 23

Piccards Make Another Stratosphere Flight

AN ALTITUDE of more than 10 miles was reached by Jean Piccard and his wife after rising from the Ford Airport, Dearborn, Mich. In the air for almost eight hours the flight ended in Cadiz, Ohio. The balloonists felt the flight was a success and that the purpose of the flight, had been accomplished. OCT. 23

Kingsford-Smith Flying Pacific to California

STARTING FROM Suva in the Fiji Islands, Sir Charles Kingsford-Smith and Capt. P. G. Taylor flew half-way across the Pacific Ocean after a 25-hour 3,150-mile non-stop flight to Honolulu, the last stopping point before they leave for Oakland, Calif., in their P. & W. Wasp-powered Lockheed, the *Lady Southern Cross.* They had flown from Brisbane to Suva, 1,760 miles, in 11 hours 45 minutes. It is 2,408 miles, over water, from Honolulu to Oakland. OCT. 29

Coming Events

Air Show

Fourteenth Internatioanl Aero Salon, Paris, France.
NOV. 16-DEC. 2

Challenge Race

Handicap race for Viceroy's Challenge Trophy. From Calcutta to Bombay. DEC. 15-16

For new SPEEDS *-new* TUBING

From San Francisco to New York in 1896, the fastest bicyclers, riding in relays day and night, each with his pacemaker, took 13 days to carry a message across the continent. Now an airplane crosses in 13 hours. For such a development of speed, a marvelous adaptation of structure has been required

Aircraft tubing requires all that science and skill can put into such a product. Lightness, strength, uniformity, durability must all be present in extraordinary degree. In the manufacture of NATIONAL-SHELBY Seamless Aircraft Tubing, therefore, every resource of metallurgy, of engineering, and of manufacturing technique is employed. This tubing conforms to the highest standards, the most severe demands, for army, navy, or civilian use, and is specified by America's leading designers of aircraft. Inquiries will be given prompt attention.

NATIONAL TUBE COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH, PA.

Pacific Coast Distributors
COLUMBIA STEEL COMPANY
San Francisco, Calif.

NATIONAL-SHELBY AIRCRAFT TUBING

Winter Flying Clothes

AIR ASSOCIATES . . . have just issued a supplement to their Catalog, showing a new two-piece winter suit, new jackets and boots and a pretty swank line of ground clothes. . . . Write for a copy—it's free.

AIR ASSOCIATES, Inc.

EASTERN BRANCH
Box 333
GARDEN CITY, N. Y.

MID-WEST BRANCH
5300 West 63rd St.
CHICAGO, ILL.

WESTERN BRANCH
1200 Airway
GLENDALE, CALIF.

THE TAYLOR CUB IS SAFE • ECONOMICAL • STURDY • STABLE

In Illinois a TAYLOR "CUB"

Earns $300.00 in the First Week

Mr. Ralph P. Swaby (above), Airport Manager, says:
"Here's a Plan that brings CASH"

They SELL for
$1425
and
$1495
Choice of Engines
"America's Safe Plane"

WHAT would you say to a Plan that gives you a TAYLOR CUB; a plan that folks "go for" in these times; that brings added flying time within the reach of all; that gives you a STEADY INCOME? Mr. Swaby grossed $300.00 the 1st week with this plan. It's a "natural." WRITE for FREE Details!

If you've never flown a CUB you can't appreciate what a value it is. It looks, handles and manoeuvers like a higher-priced plane . . . is stable, sturdy and soundly engineered. For low first cost, low upkeep and economy of operation . . . and especially for PROFIT . . . get a CUB.

• Ask about our TIME-PAYMENT Plan. FREE Folder •

TAYLOR AIRCRAFT CO.
BRADFORD, PENNSYLVANIA

(*Continued from preceding page*)

Operators Set Safety Record

MISCELLANEOUS AIRCRAFT operators flew 422,760 miles per fatal accident in the first six months of 1934, the highest figure in this category since the Bureau of Air Commerce began compilation of statistics on miscellaneous operations accidents in 1928. Miscellaneous aircraft operations include commercial (exclusive of scheduled air transportation), pleasure, instructional, and experimental flying.

For every accident, including both fatal and non-fatal, these operators flew 56,672 miles, which although not a record, compares favorably with those of previous reports.

The total number of accidents in miscellaneous flying during the period January-June, 1934 was 649, of which 87 resulted in fatalities. The number of miles flown per passenger fatality was 490,402, and the number of miles flown per pilot fatality was 540,885.

In all, 1,146 persons were involved in the accidents. Of these, 793 suffered no injuries, 132 suffered minor injuries, 61 suffered severe injuries, and 160 were fatally injured.

Causes of the accidents were divided as follows: personnel, 52.72 per cent; power plant failures, 16.25; airplane failures, 10.50; miscellaneous (including weather, airport or terrain and other), 19.91; undetermined and doubtful, .62.

The study of the miscellaneous accidents with reference to violations of the Air Commerce Regulations revealed that there were 78 flights involving both accidents and violations. In some cases, more than one regulation was violated, and the total number of violations occurring in connection with the 78 flights was 107.

Nemuth parasol-type monoplane powered by a Warner Scarab engine of 110 h.p.

Chance Vought Elects McClane

CHANCE VOUGHT Corporation, E. Hartford, Conn., announced the election of Joseph L. McClane, its factory manager, to the Board of Directors.

Mr. McClane, has been active in aviation for 17 years, beginning his career in 1917 with the U. S. Army Signal Corps as an engineer, later being transferred to the Air Service experimental station at McCook Field, Dayton, Ohio. Subsequently he served with the Dayton Wright Co., Wright Aeronautical Corp., and Consolidated Aircraft Corp. In 1930 he joined the Chance Vought Company as Project Engineer.

Two Beechcraft Delivered

BEECH AIRCRAFT Co., Wichita, Kans., delivered a Jacobs-powered Beechcraft to the Beeler Aircraft Sales, Inc., Curtiss-Reynolds Airport, Chicago, Illinois. Mr. Beeler is a Beechcraft distributor and handles distribution in the Chicago area.

Mrs. Mable G. Clemson, Middletown, New York took delivery on a Jacobs-powered Beechcraft, the plane to be flown by Lloyd O. Yost of Middletown and Southern Pines, N. C.

Taylor Plant At Full Strength

TAYLOR AIRCRAFT Co., Bradford, Penna., has more than doubled its personnel since the beginning of the year, necessitated by the steadily increasing number of orders received. At present, the company is turning out three times the number of Cubs produced last year, and is unable to make deliveries enough to keep up with orders.

According to W. J. Piper, Jr., company engineers are working on plans for a Cub with floats, which it is estimated will sell for about $2000.

Aldrin Returns From Abroad

MAJOR E. E. ALDRIN, head of the aviation department of the Standard Oil Company of New Jersey, returned to New York following an extensive European trip in the interests of the Stanavo Specification Board, Inc., the aviation affiliate of the New Jersey company.

Major Aldrin left last August and visited Germany, France, Italy, England, Holland, Switzerland and the Scandinavian countries. In addition to taking part in his company's plans for servicing contestants in the MacRobertson Trophy Race, Major Aldrin represented the Aeronautical Chamber of Commerce of America at the sessions of the International Air Transport Association, held at The Hague late in August.

Operators Must Pay Utah Tax

THREE TRANSPORT companies lost their dispute with the state of Utah over taxes on gasoline they used. By judicial stipulation the state will receive approximately $20,000 on levies accruing since September, 1930, the agreement providing for payment of the tax by the airlines in future without protest. The three companies involved are the United Air Lines, including Boeing Air Transport and Varney; Western Air Express and National Parks Airways.

The controversy arose September 15, 1930, when a district court decree enjoined the Secretary of State and the State Treasurer from collecting a tax on gasoline imported into Utah for use in airplanes operated in interstate commerce. The state tax commission then attempted to collect the taxes.

The settlement reached in Utah is based upon a decision handed down by the U. S. Supreme Court a year ago in a Wyoming case. The court held that imported gasoline stored in tanks could be taxed by the state as soon as it was removed from the tanks within the state's jurisdiction regardless of its use.

Stanavo Buys Two Monocoupes

LAMBERT Aircraft Corp., Lambert Field, Robertson, Mo., has delivered two De Luxe model 90 Monocoupes to the Standard Oil Company of New Jersey. The Stanavo design trademark, a red eagle on a white background, will be painted on the under parts of the wings, cowling, fuselage and tail.

The planes are two-place cabin models with a top speed of 140 m.p.h. and cruising speed of 120 m.p.h. A 15-gallon extra fuel tank was built behind the pilot's seat, giving a total capacity of 43 gallons. Extra instruments include a turn and bank indicator, rate of climb indicator and sensitive altimeter.

Two more Monocoupes were exported to Seville, Spain, being shipped to M. Arteman, the company's representative in that country.

New Weather Service Started

AIRMEN FLYING on many Federal airways can now receive weather forecasts for their courses every four hours by radio-telephone from Department of Commerce airways radio stations, through a new service started by 29 stations. It is in addition to the hourly radio reports of current airways weather now transmitted throughout the United States by the Commerce Department's stations.

Rex Martin, Assistant Director of Air Commerce in charge of air navigation, explained that forecasts may now be obtained at airports where there are Department of Commerce communications facilities which collect them from stations on the airways. However, it has not been feasible heretofore to broadcast them for the reason that it would require a longer interruption of the radio range beacon signals upon which airmen rely heavily during poor visibility conditions. These signals are cut off during voice broadcasts as both are transmitted on the same frequency. Now, arrangements are being completed to give the forecasts on another frequency so that they will not interfere with radio beacon operation. This will supply a service for which the Department has had many requests but has not been able to provide before this because of the problem of finding a suitable alternate frequency for the weather forecasts.

The forecasts will go on the air six times daily at 1:31 a. m., 5:31 a. m., 9:31 a. m., 1:31 p. m., 5:31 p. m., and 9:31 p. m., E. S. T., immediately following the regular 30-minutes-past-the-hour broadcasts of local weather. When the local weather report has been given, the announcer will notify listeners to turn to another dial setting for the forecasts. The radio beacon signals will then be resumed.

Stations which are now transmitting the weather forecasts are located at the following points: Amarillo, Tex.; Atlanta, Ga.; Bellefonte, Pa.; Big Springs, Tex.; Birmingham, Ala.; Buffalo, N. Y.; Chicago, Ill.; Cincinnati and Cleveland, Ohio; Ft. Worth, Tex.; Fresno, Calif.; Harrisburg, Pa.; Iowa City, Iowa; Jackson, Miss.; Jacksonville, Fla.; Kingman, Ariz.; La Crosse, Wis.; Little Rock, Ark.; Medford, Ore.; Newark, N. J.; New Orleans, La.; Richmond, Va.; Shreveport, La.; Spartanburg, S. C.; Springfield, and St. Louis, Mo.; Washington, D. C.; Wichita, Kan.; and Winslow, Ariz.

Electra Production Increasing

IN ORDER to fill orders for 23 Electras under contract, the Lockheed Aircraft Corp., has doubled the floor space of its factory at Burbank, Calif., and has increased its payroll from 150 to 600 employees during a period extending over the last six months. The company is aiming at a production schedule of four twin-engined Electras per month.

N.A.A. Elects McAdoo

AFFAIRS OF the National Aeronautic Association will be under the direction of a new president, following acceptance of that post by Senator William G. McAdoo of California. Senator McAdoo replaces ex-Senator Hiram Bingham who served as president for the past six years.

Other officers elected were James H. Doolittle, vice-president; Louise Thaden, secretary and John F. Victory, treasurer.

Radio Operates Typewriter For Reports

TYPEWRITERS OPERATED by radio may be used on the Federal Airways System for dissemination of weather information, if experiments now being conducted by the Bureau of Air Commerce meet continued success. A radio typewriter with which the Bureau is operating an experimental circuit between Silver Hill, Md., and the Commerce Department building, has transmitted a weather map with tabulated weather data, in 7½ minutes, as compared with about 15 minutes required for accomplishment of this task by the wire machines now in service on the airways.

13,812 Pilots, 6,798 Planes Licensed

ACTIVE DEPARTMENT of Commerce licenses on October 1, 1934 were held by 13,812 pilots and 6,798 aircraft, according to a study made by the Bureau of Air Commerce. These may be compared with October 1, 1933, when there were 16,176 licensed pilots and 6,992 licensed aircraft.

The decrease in the number of pilot licenses is due in part to the reversion of many private and solo licenses to the student grade when the private pilot requirements were raised and issuance of new solo licenses was discontinued. This is shown by the fact that on October 1, 1933 there were 9,056 student licenses, while on the first day of October, 1934 this number had increased to 13,456.

The total number of aircraft, licensed and unlicensed, of which the Department had record on October 1, 1934 was 8,542, while this number on the corresponding day of last year was 9,287. Unlicensed aircraft (bearing identification numbers only) totaled 1,744 on the first of October 1934.

Among the 13,812 persons holding pilots' licenses as of October 1, 1934 were 7,128 transport, 1,023 limited commercial, 4,999 private, 620 amateur, 11 industrial and 31 solo pilots.

California had more pilots and aircraft than any other state with 2,519 and 928 respectively. New York had 834 planes; Illinois, 562; and Pennsylvania 530. New York was second in pilots with 1,407; Illinois had 835; Ohio, 791 and Pennsylvania, 731.

Approved Type Certificates Issued

THE BUREAU of Air Commerce of the Department of Air Commerce has issued approved type certificates covering three aircraft and five aircraft engines as follows:

Kinner Airplane and Engine Co., Glendale, Calif., Model Playboy R, a two-place closed land monoplane powered by a Kinner R-5 engine of 160 h.p. ATC 554.

Douglas Aircraft Corp., Santa Monica, Calif., Model DC2-115, a 16-place closed land monoplane powered by two Wright Cyclone SGR 1820F-2 engines of 720 h.p. each. ATC 555.

Stinson Aircraft Corp., Wayne, Mich., Model A, a 10-place closed land monoplane powered by three Lycoming R-680 engines of 260 h.p., each. ATC 556.

Pratt & Whitney Aircraft Corp., E. Hartford, Conn., Model Wasp S3D1, a 9-cylinder, radial, air-cooled engine rated 450 h.p., at 2,100 r.p.m., at 6,000 ft. 80 Octane (Relisted to show altitude). ATC 128.

Pratt & Whitney Model Wasp S1H1-G, a 9-cylinder, radial, air-cooled engine rated 550 h.p., at 2,200 r.p.m., at 8,000 ft. Octane 83 (Relisted to show correction in model and altitude). ATC 129.

Pratt & Whitney Model Wasp S6D1, a 9-cylinder, radial, air-cooled engine rated 450 h.p., at 2,100 r.p.m., at 4,500 ft. Octane 80. ATC 130.

Wright Aeronautical Corp., Paterson, N. J., Model Conqueror GV-1570F-2, a 12-cylinder, Vee (60°) liquid-cooled engine rated 675 h.p., at 2,450 r.p.m. Octane 87. ACT 131.

Wright Model Super-Conqueror SGV-1570F-d, a 12-cylinder, Vee (60°) liquid-cooled engine rated 705 h.p., at 2,450 r.p.m. at 7,000 ft. Octane 87. ATC 132.

WRIGHT PLANE MAY COME BACK TO THIS COUNTRY

ORVILLE WRIGHT has indicated that he will reassign his original flying machine to the Smithsonian Institution in Washington if the result of an investigating committee's study is satisfactory. The plane is now in a British museum where it was sent when Wright objected to having Langley's plane called the first to fly.

Straughan Company Sold

WITH THE purchase of the Straughan Aircraft Corp., of Wichita, Kansas, by Mark Kleedon, the company's manufacturing unit is being removed to Oklahoma City. Mr. Kleedon is president of the Black Gold Refining Co., of that city and plans to begin the manufacturing of planes as soon as possible.

Temporarily, the company will make headquarters at the Municipal Airport, pending erection of a building there. Ten demonstrators were brought to the city port under direction of Burrell Tibbs, and are housed in the municipal hangars.

The purchase and removal involve an expenditure of $50,000, and the expansion program announced by Mr. Kleedon includes an additional $50,000 when needed.

The proposed plant will produce one plane daily, and employ 50 men. The Straughan ship is a small two-passenger biplane, powered with a modified automobile engine, giving it a cruising speed of 90 m.p.h. and top speed of 110 m.p.h.

1,000th Controllable Prop Made

EIGHTEEN MONTHS after the first controllable-pitch propeller came off the production line at the Hamilton Standard Propeller Co., E. Hartford, Conn., the 1000th controllable was produced.

Some of the early models already have more than 2000 hours of service. The propellers have been used in military craft and commercial airliners both here and abroad and they are now on order for foreign lines in South America, Spain, Italy, Sweden, Germany, China, Poland, Switzerland, France and Japan. In this country they are used on six different lines.

Martin Studying European Aviation

REX MARTIN, assistant director of the Bureau of Air Commerce in charge of air navigation, sailed from New York as an official American delegate to the International Aeronautical Exposition to be held in Paris.

In addition to attending the Exposition, Martin will study aeronautical development in Europe as it applies to civil and commercial aviation.

While in England he will also study the highly effective system of airport traffic control at Croydon, London's air terminal, which employs unique methods of directing aircraft in foggy weather.

He also will look into the development of the radio compass and the long-distance operations of Imperial Airways.

Ten Vultees Delivered

AVIATION DEVELOPMENT Corp., builders of the Vultee transport with its factory at Grand Central Air Terminal, Glendale, Calif., has completed and delivered the first group of ten passenger airplanes constructed for American Airlines and is well along in building the second ten for the same line.

Two other Vultees have been built and delivered to individuals.

New Company Formed

WORKERS AIRCRAFT & Manufacturing Corp., plans production of airplanes and airplane parts or accessories in Baltimore, Md. The concern was recently organized by Joseph Catozzi.

New Fuel For Aviation Use

TRI-METHYL-ISO butyl-methane, a pure hydrocarbon used as a yardstick to measure the anti-knock properties of gasoline, can now be produced commercially and will soon be available for compounding in aviation fuel, according to Frank A. Howard, president of the Standard Oil Development Co.

Perfection of the process to manufacture the chemical on a commercial scale will allow the industry to expand power and speed without danger of detonation, it is said.

For the past six years iso-octane, with an arbitrary rating of 100, has been the theoretical perfection toward which oil refiners reached in developing anti-knock gasoline. Iso-octane will make a 100 octane number fuel when mixed with ordinary aviation gasoline in 50-50 proportions with the addition of the usual quantity of tetraethyl lead.

Norma-Hoffmann Appoints Agent

THE NORMA-HOFFMANN Bearings Corp., Stamford, Conn., manufacturers of precision ball and roller bearings, has appointed E. W. Lawrence as its southern representative. Lawrence has for the past 11 years been connected with the New York Sales office.

217 MILES IN 65 MINUTES

With a Stock Model Beechcraft

The high speed of the 225 h.p. Beechcraft is the result of ultra-streamlining.

SLOW LANDING SPEED is achieved with its exceptionally light wing loading (11.5 lbs. per sq. ft.)—45 m.p.h.

The BEECH AIRCRAFT COMPANY ▼ ▼ Wichita, Kansas

AMERICAN STEEL SHEETS

FOR ALL KNOWN USES

KEYSTONE COPPER STEEL — AMERICAN SHEET AND TIN PLATE COMPANY — PITTSBURGH

In Aviation Fields

Use sheet metal products of recognized reputation and value for hangars, shops, sheds, culverts, and similar purposes.

Insist upon AMERICAN Black Sheets, Keystone Rust Resisting Copper Steel Sheets, Apollo Best Bloom Galvanized Sheets, Galvannealed Sheets, Heavy-Coated Galvanized Sheets, Formed Roofing and Siding Products, Tin Plates, Terne Plates, Black Plate, Etc.

Write us relative to your sheet steel requirements. This Company also manufactures USS STAINLESS and Heat Resisting Steel Sheets and Light Plates for all purposes.

AMERICAN SHEET AND TIN PLATE COMPANY, Pittsburgh, Pa.

SUBSIDIARY of UNITED STATES STEEL CORPORATION

LEARN TO FLY!

Lieutenant Commander Paul E. Gillespie, Director and Chief Instructor.

FOR SPORT BUSINESS PROFESSION

Reduced Fall Rates

Hugh Copeland, Transport Pilot, Chief Ground and Mechanic Instructor.

Start your flight training now for Sport or Professional career at World Renowned Roosevelt Aviation School backed by eight consecutive years and some 30,000 hours of successful instructional operations under the personal direction of Paul E. Gillespie, overseas war pilot, famous instructor for modern U. S. Navy, air mail pilot and instructor of mail pilots in instrument flying. Competent and experienced staff.

Flying courses offered: Amateur, Private, Limited Commercial and Transport: Special Blind Flying. In Aviation Mechanics: Regular and Master Mechanics.

HIGHEST GOVERNMENT RATING

Visit us or write for booklet Y. Write or print name plainly, stating age and course preference.

ROOSEVELT AVIATION SCHOOL

Mineola, New York — Garden City 8000

FOREIGN NEWS IN BRIEF

Australasia

A TRI-WEEKLY service between Sydney and Narromine, with stops at large western towns on the route, will shortly be inaugurated by Kingsford-Smith Air Service. Feeder services to the new line are planned, and twin-engined British aircraft will be acquired.

QANTAS, LTD., reported record bookings of passengers during the past few months with July being outstanding. More than 380 passengers were carried during that month in addition to 3,545 pounds of express. The company was unable to meet the demands of its customers and was compelled to turn away passengers and freight.

AIDED BY a strong wing, an Adastra Airways mail and passenger deHavilland Fox Moth, made a record flight from Bega to Sydney, flying the 210 miles in 90 minutes.

C.T.P. ULM and a crew, flying the *Faith of Australia,* completed a return flight from Australia to New Guinea carrying the first air mail to and from the goldfields. The round-trip took five days and demonstrated the feasibility of a regular service from Australia to Papua and New Guinea. Almost 40,000 letters were carried on the return trip.

BIDS HAVE been asked by the Commonwealth Government for an air transport service between Bourke and Adelaide, a distance of 590 miles. Aircraft must have a cruising speed of not less than 110 m.p.h., and be capable of carrying not less than 4 passengers and mail and baggage. The service is intended to provide a direct oversea air mail connection for the industries in Renmark and Broken Hill.

FOLLOWING THE acquisition of New England Airways by the British Pacific Trust, a new company was formed in Sydney. Plans call for the extension of the existing service between Brisbane and Sydney to Melbourne and the inauguration of night flying. A schedule of 7 hours is the goal, and for this purpose, it is intended to purchase new planes capable of a speed of at least 150 m.p.h.

THE COMMONWEALTH Government has placed a Royal Australian Air Force amphibion at the disposal of the Administrator of the Northern Territory as an aid in his efforts to combat smuggling on the north coast of Australia.

THE AIRPORT at Cootamundra, the future distributing point for the Empire air mails, is being improved. A large area has been fenced off, the runways extended, the entire surface graded and boundaries wired for lighting equipment.

AN APPLICATION by Qantas Empire Airways, Ltd., for permission, when the oversea air mail service was opened, to extend its service to Sydney from Brisbane, has been granted by the Department of Defence.

DETAILED ARRANGEMENTS have been completed for a geophysical survey of North Australia, and bids for the work have been asked. The bids include the hire of all planes and personnel required, and also cover the photographic work. Special cameras are to be used for making a mosaic of the areas covered.

Canada

THE TORONTO Flying Club recently held its annual field day with club pilots from Brantford, Kitchener and Kingston participating. Most of the prizes were won by members of the Toronto club. Judges were Capt. Pat Reid, Squadron Leader Geoffrey O'Brian and Ft. Lieut. Dwight Ross.

ONTARIO PILOTS have been busily engaged with a number of new gold rushes in northern Ontario near the transcontinental railway. With winter closing in on the northland, it was necessary to supplement the train service into the new mining region with planes to fly in men, supplies of food, machinery and other necessities. During freeze-up it is impossible to fly in this region because the planes used are equipped with floats and the water is not open enough nor the ice heavy enough to withstand the landing of a ski-equipped plane. Pilots were making 20 or more trips a day into the region.

THE SISKIN fighters of the Royal Canadian Air Force will probably be replaced by more efficient equipment in the near future, according to Donald M. Sutherland, Minister of National Defence who also stated that the government expected to move the R.C.A.F. from Camp Bordon to a new base at Trenton. The change is expected to take place this fall, but it probably will not be completed until next year.

TITLE OF best-all-round pilot in the Dominion was won by E. C. Cox of the Montreal Light Aeroplane Club who took his third successive victory and retained the Webster Trophy. Pilots from Vancouver, Ottawa, Montreal and Hamilton were entered in the competition and second place went to James Neeve, Toronto Flying Club, who received the Sully Trophy. Third place and the Richards Trophy went to George Lothian of Vancouver.

THE FIRST six emergency fields in northern Ontario, built as part of an unemployment relief program, were opened by Commander J. A. Wilson, Director of Civil Aviation who opened the field at Porquis Junction, near Cochrane, Ont., at the same time the other fields in that district were declared ready for use. They are the first of a number of fields being built as part of the trans-Canada airway, which is expected to be ready early in 1935. The fields in the Maritimes and eastern Quebec will be finished after northern Ontario and western Canada have been equipped.

A NEW association of war fliers,

(Continued on following page)

Savoia-Marchetti S-73, a tri-motored passenger plane for 10-18 persons, powered by Gnome & Rhone 9KFR engines of 600 h.p. each

(*Continued from preceding page*)
formed in Toronto and known as the Royal Air Force Association, is open to men who flew with the Royal Air Force during the war. Its patron is Dr. H. A. Bruce, Lieut.-Governor of Ontario and its officers are E. M. Smith, president; G. W. Wooton, vice-president; Earl Hand, 2nd vice-president; V. H. Metcalfe, secretary; Reginald Brett, assistant secretary; R. Farquharson, treasurer.

France

AN ORDER for 10 ambulance planes has been received by Marcel Bloch in addition to the 80 bombers ordered by the Government. General Denain, French Air Minister, has already announced contracts awarded for 110 Dewoitine single-seat fighters, 40 Amiot multi-seat attack planes and a similar number of Breguets; 55 Morane-Saulnier fighters; 50 single-seater Nieuports; 74 scouter Mureaus; 140 Breguets and 100 Potez scout planes. In addition, it is reported that a large order has been placed for Liore and Olivier bombers.

Great Britain

A SQUADRON of ten Avro Type 626 military biplanes has been added to the Egyptian Army Air Force. The first squadron of similar aircraft flew from England to Egypt towards the end of last year and since then it has been engaged in patrol and reconnaissance duties. Each Avro in the Egyptian service is equipped for a variety of duties, including aerial photography, reconnaissance, light bombing and machine gunning.

DEMONSTRATION FLIGHTS at Hanworth airdrome, near London, of planes equipped with a new-type engine silencer have proved the possibility of abating a considerable proportion of engine noise without undue loss of power. The silencer is the first to be approved by the Air Ministry. It may be installed in the new Handley Page and Fairey bombers being built for the R.A.F. A noise reduction of 30 decibles was achieved at a sacrifice of about 2 per cent of engine power.

THE AIR SERVICE Training, Ltd., Hamble flying school, set new marks during 1933 when 6,428 hours were flown compared with 4,380 in 1932. Nineteen pupils qualified for the amateur pilot rating, 16 for the commercial pilot's license, six as ground engineers and seven for the government's radio operator license. Air Force Reserve officers who took refresher courses during the year numbered 209, while a considerable number of students took short courses ranging from the advanced course for flying instructors to blind and seaplane flying.

ORDERS HAVE recently been placed by the Air Ministry for a number of Vickers *Vincent* general purpose military planes, specially designed for overseas service. The plane is noted for its load-carrying ability, transporting up to 4250 pounds in fuel, crew of three and military equipment on the power of one Bristol *Pegasus* engine. The *Vincent* is of all-metal construction with fabric covering.

SUCCESSFUL TEST flights of the new Comper *Streak* were recently conducted at Heston airport. The plane is powered by a 130 h.p. Gipsy *Major* engine and reaches a top speed of about 200 m.p.h. It seats one person and features a retractable landing gear.

DIESEL ENGINE production at the Napier plant in Acton is now under way on the *Culverin*, a 720 h.p. engine and the *Cutlas* which develops 550 h.p. The engines have six cylinders arranged in-line, opposed pistons and two crankshafts. They weigh about 2¼ pounds per horsepower, each.

TWO EXPORT sales were made by the Spartan company when it sold tri-motored *Cruisers* to Bata's, the Czechoslovakian shoe manufacturing company, which owns and operates an airport at Zlin and to Aeroput, the Jugo-Slavian air transport company. The latter also signed an agreement to acquire the license to build the *Cruiser*. The Spartan *Cruiser* normally carries six passengers in a comfortable cabin, with powers derived from de Haviland Gipsy *Major* 130 h.p. air-cooled engines. Its cruising speed is about 118 m.p.h.

Mexico

CIVIL AVIATION made outstanding progress in 1933, according to the Ministry of Communications and Public Works. Records reveal the transportation of 39,123 passengers, 126,585 lbs. of mail, 1,733,874 lbs. of express and 985,595 lbs. of baggage in 19,830 flights that covered 2,525,184 miles in 24,781 hours 43 minutes with 4,470 persons carried in December, the best passenger month of the year.

Air express did exceptionally well with the shipment of minerals and coffee. Cia Aeronautica de la Sierra, subsidiary of West Mexican Mines, carried 342,639 lbs. of minerals between Tayoltita and Mazatlan in 455 flights, and San Luis Mining Co. transported 277,082 lbs. in 616 flights.

The average regularity of performance on the air network was 94.33 per cent. Cia Aerovias Centrales, S. A., flew 96.97; Cia Aeronautica de la Sierra, S. A., 96.81; Pan American Airways, 96.36; Mexican Aviation Co. (Pan American Airways), 94.27; Cia Aeronautica de Sur, S. A., 94.20; Rutas Occidentales, S. A., 93.34; and Servicio General Aereo, S. A., 88.70.

Norway

WIDEROE'S FLYVESELSKAP A/S recently was granted a 2-month concession to operate a passenger and mail service between Oslo, Christiansand, Stravanger, and Haugesund. If successful the service may be extended to Bergen. Savings up to 36 hours will be effected by the service which is scheduled to connect with train services.

A NEW land and seaplane base at Oslo to cost $1,266,000 and to be finished in 1936 has been authorized. The city council purchased the land and authorized the expenditure of $379,800 for the initial construction work on the project. Work started September 1 and 700 to 800 men will be employed there during the winter.

Spain

SCHEDULED AIR services in Spain were maintained exclusively in 1933 by the government-owned Lineas Areas Postales Espanolas, successor of the old concessionary company which united private services into a subsidized organization a few years ago. The services are between Madrid and Barcelona (311 miles) and between Madrid and Sevilla (261 miles) and flights are daily in each direction. There were 222 licensed private pilots in Spain at the end of 1933 and 41 licensed transport pilots, as well as 96 licensed civil aircraft.

Traffic decreased in 1933 due chiefly to the 6-day-a-week service in 1933 compared with the every-day service in 1932.

The fleet consists of 3 tri-motored Junkers; 7 tri-motored Fokkers; 1 Ford; 1 Breguet; a Moth; and a Savoia seaplane. All the Fokkers and the Ford are in regular service.

Sweden

MALMO AIRPORT traffic increased during the first half of 1934 as compared with the same part of 1933. The number of commercial aircraft clearing the airport was 1,738 compared with 1,400 in the 1933 period; the number of departures of military, school, and other planes dropped from 1,439 in the 1933 period to 1,135. The number of passengers increased from 3,970 in the first half of 1933 to 7,868 in the first half of 1934. Freight increased from 182,188 lbs. to 234,671 lbs. and air mail increased from 112,898 to 130,041 lbs.

STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS, MARCH 3, 1933

of AERO DIGEST, publisbed monthly at New York, N. Y., for October 1, 1934.

State of New York, } ss.:
County of New York, }

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Frank A. Ticbenor, who, baving been duly sworn according to law, deposes and says tbat he is the Business Manager of the AERO DIGEST, and that tbe following is, to the best of his knowledge and belief, a true statement of the ownersbip, management, etc., of the aforesaid publication for tbe date sbown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

1. Tbat the names and addresses of the publisber, editor, managing editor, and business managers are: Publisher, The Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y.; Editor, George F. McLaughlin, 515 Madison Avenue, New York, N. Y.; Managing Editor, None; Business Manager, Frank A. Tichenor, 515 Madison Avenue, New York, N. Y.

2. That the owners are: Tbe Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y.; Frank A. Tichenor, 515 Madison Avenue, New York, N. Y.; Jessie H. Ticbenor, 515 Madison Avenue, New York, N. Y.

3. That the known bondholders, mortgagees, and otber security bolders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving tbe names of the owners, stockholders, and security bolders, if any, contain not only the list of stockholders and security bolders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any otber fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and tbis affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed) FRANK A. TICHENOR.

Sworn to and subscribed before me tbis 24tb day of September, 1934.

(Signed) H. F. Koster, Notary Public.
Kings Co. Clerk's No. 82; New York Co. Clerk's No. 278.
(My Commission expires March 30, 1936.)

WINGS FOR OUR FOREIGN TRADE

(*Continued from page* 19)

welcomed by people friendly to these enterprising Americans who by their capital and invention were bringing the rest of the world closer to them.

These North American newspapermen were making a trip in fourteen days, which, by other means would have taken six weeks if they had visited only one or two points of South America en route. They called at a score of cities.

They might as well have been salesmen for they were accomplishing a circuit of "prospects" such as no person ever has done in so short a time.

In Rio de Janeiro an example was furnished as to what North-to-South America commercial air transportation means. An Associated Press correspondent there wrote the following comment on the day after the arrival of the plane:

"Women here are using the lipstick and silk stockings shipped a week before out of the United States.

"Families are breakfasting on oatmeal seven days in transit from the American producer to their table.

"Ambassador Hugh S. Gibson is fingering a directory of the city of Washington which came, like other products recently, by airplane from New York.

"Foreign Minister Jose Carlos de Macedo Soares and his staff are turning over pages of American magazines and reviews as new here as they are in some parts of the United States.

"In Guanabara palace, Mrs. Darcy Vargas, wife of the president of Brazil, set up in a vase artificial flowers airmailed by the governor of the state of Wisconsin.

"A firm here is exhibiting the latest sewing machine from the United States and advertising it 'sent by airplane.'

"Other goods brought in the first parcel post express air shipment include: Films, parlor games, medicines, books, dyeing materials, cotton shirts, phonograph records, gear wheels, a dress and current weekly magazines."

That list of events was regarded as spectacular by the Brazilian public, whose interest was real. But the mere fact that articles for sale had arrived quickly was not so impressive as the suggestion it gave as to commercial possibilities in the countries of Latin America.

United States business firms traditionally have operated on the theory of salesmanship to distributors. Commercial houses in general send out their men to call on prospects. They are travelers, living on the road. European nations which sell products in Latin America operate almost as generally on the principle of native representatives—that is, local salesmen who are permanent residents of the country in which they operate and do business.

Many observers in Latin America have expressed the opinion that the European method is more adapted to the Latin American market. The Spanish and Portuguese nations to the south do not always readily adopt North American methods of commerce.

But the air-traveling salesman is regarded in many commercial quarters as having a decided advantage over the resident representative in that the flier can keep in close personal touch with every new development at home and tell his clients about it almost simultaneously.

UTILITY OF MODERN PRIVATE AIRPLANES

(*Continued from page* 15)

540 to 550 miles for the round trip. My speed was very close to 110 miles average, turning my engine at 2,000. . . . I am getting a kick out of flying with this new plane. With the wing flaps, I can set it in any place I want to, and as to take-off, I am certainly much surprised."

There are any number of "Dr. Brocks" in the United States who, if properly approached, could and would be pleased with such light plane utility. Nor is the operation of the personal airplane confined to land operations. At the foot of Wall Street, New York City, a new municipal seaplane base has been established and from vantage points of a high office building, it is interesting to watch the arrivals and departures of many business and pleasure bound airplanes which use the waterways as their air trails. To make the trip from Detroit to the Thousand Islands by private boat necessitates a considerable outlay for comfortable equipment if the time necessary for such a cruise is to be enjoyed fully. However, to fly the same route by seaplane is but a matter of a few hours with an abundance of landing area and the maximum time available for pleasure or business pursuits. While at the far end of the journey it is not difficult to visualize the thousands of points of interest to be visited, efficiently, comfortably and handily by seaplane along the Atlantic coast from the Florida Keys to Nova Scotia.

In contrast to such sports flying is the use of a light cabin airplane by a St. Louis, Missouri, company for the inspection of pipe lines over a five or six hundred mile area. In Eastern Texas, and throughout the southern oil fields, the utility of the light cabin airplane for pipe-line survey is evidenced in the fact that inspection flights are carried out in all kinds of weather conditions and over all types of terrain.

There are others too numerous to mention, but we picture and write about a few to substantiate our claim that—as silver in Mexico—the surface hasn't been furrowed as yet.

PERSONAIRLITIES

(*Continued from page* 45)

over the plane checking everything, and Whitbeck with glasses and fruit juice and ice and cigars and I don't know what all. When I asked for my bill, there was no bill. No, sir, I was a guest of my old pal Whitbeck for everything, and wouldn't I have another? Well, I would, just for old time's sake—and then I must be off. Time, tide, and the start of the West Indian Aerial Express waited for no man, and only a few women, and I had to be going.

It was then that Pink Whiskers implored me to wait over a day and fly this little load of mail to Havana. It wasn't important he said, except as a favor to him, but he'd appreciate it. Since that first trip, Pan American Airways has developed to be the largest airway system in the world. And the pilot who flew their first official mail trip got nothing out of it except hospitality. That just goes to show how smart old pilots were!

But getting back to Pink Whiskers, the old boy has been touring the world for the past year studying general aviation conditions in the leading countries of the world, and covering the development of new designs, both commercial and military, where possible, and the methods of procurement of various governments. He now knows how they do it in every country of the globe, and I hope he can sell all this information to some one.

IT'S A GIFT

an aviation man likes to *GIVE* just as it is one he likes to *RECEIVE*

YOU, who had to *buy* AERO DIGEST—wouldn't it have made a hit with you if someone had *given* you your subscription last Christmas?

Exactly. Now you know how your aviation friends will appreciate a subscription to AERO DIGEST for Christmas this year.

For those who already are regular readers of AERO DIGEST we suggest a subscription to THE SPORTSMAN PILOT. And for those who are especially good friends—a Combination Subscription: one year of AERO DIGEST and one year of THE SPORTSMAN PILOT.

We can think of no more convenient way to do your shopping—and of mighty few that are as economical, considering the size of the gift.

Here are the prices:

AERO DIGEST or THE SPORTSMAN PILOT

	U. S.	Canada	Foreign
One year	$3	$4	$5
Two years	$5	$7	$9

Combination Subscription (one year of AERO DIGEST and one year of THE SPORTSMAN PILOT)—$5 in the United States; $7.25 in Canada; $8 in other foreign countries.

Enclosed is $..... covering the following Christmas Gift Subscriptions as noted. Send Gift Announcement Cards and first copies of the new subscriptions in time for Christmas delivery.

Donor .....

1. ☐ 1 yr. ☐ 2 yrs. AERO DIGEST
☐ 1 yr. ☐ 2 yrs. THE SPORTSMAN PILOT
☐ COMBINATION SUBSCRIPTION
.....
.....
.....
.....

2. ☐ 1 yr. ☐ 2 yrs. AERO DIGEST
☐ 1 yr. ☐ 2 yrs. THE SPORTSMAN PILOT
☐ COMBINATION SUBSCRIPTION
.....
.....
.....
.....

3. ☐ 1 yr. ☐ 2 yrs. AERO DIGEST
☐ 1 yr. ☐ 2 yrs. THE SPORTSMAN PILOT
☐ COMBINATION SUBSCRIPTION
.....
.....
.....
.....

4. ☐ 1 yr. ☐ 2 yrs. AERO DIGEST
☐ 1 yr. ☐ 2 yrs. THE SPORTSMAN PILOT
☐ COMBINATION SUBSCRIPTION
.....
.....
.....
.....

AERO DIGEST 515 Madison Ave. New York, N. Y.

FLEETWINGS ANNOUNCES

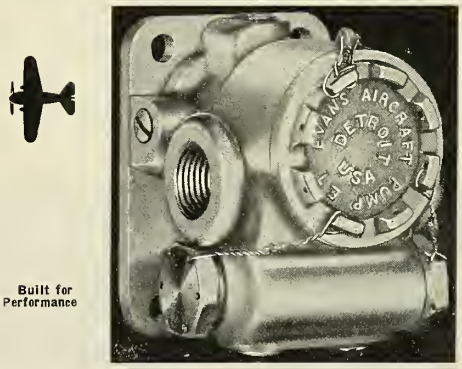
"SHOTWELD" STAINLESS STEEL

GASOLINE TANKS

Fleetwings has at last perfected, after months of research, Stainless Steel Gasoline Tanks that represent a forward step for the industry. These tanks have passed every vibration and drop test with perfect results. Due to the Shotwelded Stainless Steel, these tanks are corrosion-proof and unusually light and strong. Properly designed, their resistance to fatigue is remarkable. Light weight is a particular feature and in some shapes, these tanks are as light as .35 pounds per gallon. Engineers and manufacturers are invited to write for full information (please use your letterhead). We will be glad to hear from you, or consult with you on gasoline and oil tank problems.

CONTRACTORS TO THE ARMY AND NAVY

FLEETWINGS INCORPORATED BRISTOL PENNA.



Built for Performance

Not to a Price

Unequalled Reliability recommends the Evans E-7 Aircraft Fuel Pump

The hazard of gasoline leakage is positively eliminated hy a spring-loaded flexible sylphon seal that takes the place of conventional packing. A flexible shaft entirely overcomes the possihility of shaft hreakage which has always heen one of the principal causes of pump failure. No other aircraft fuel pump has these two advantages. Integral relief valve and wahhle pump hypass permit more simple and compact installation. The Evans E-7 primes at speeds as low as 50 r.p.m. and provides fuel at constant pressure regardless of variations in fuel consumption.

These are only a few of the features; write for complete specifications that show why the Evans E-7 is far superior to other aircraft fuel pumps.

THE EVANS APPLIANCE COMPANY

253 Vinewood Avenue, Detroit, Michigan

90 West Street New York

Pacific Airmotive Corp., Ltd. Union Air Term., Burhank, Cal

THE PUNCTURED GENERAL

(*Continued from page* 17)

have occurred to them, but a younger man must have done it. Now, Watson, did you notice anything peculiar?"

"They're all peculiar," I replied.

"No, no," he said, "that isn't what I meant. Did you notice that we are short a general? Where is General Sir Douglas MacArthur, Bart., Chief of Staff? No, he isn't under the table, Watson—I've already looked there. But he must be *somewhere* about, *for the General Staff doesn't dare do anything if he isn't around.* He must be here. And where is that old wretch who showed us in?"

"There must be a dust closet somewhere about," Holmes muttered, opening door after door along the corridor. "Ah, here we are, Watson," he cried triumphantly as he threw open the door of a closet filled with mops, brooms and pails. Hastily arraying himself in a rather dirty apron and shawl, Sherlock Holmes took a grey wig from his pocket, clapped it on his head, seized a mop and pail, and left the closet disguised as a charwoman.

Just as we left, the ancient Quartermaster Sergeant appeared and looked at us suspiciously. "What are you doing there?" he asked harshly.

"Lor' lumme sir, you *did* give me a start!" cried Sherlock Holmes in shrill cracked tones. "Hi h'am just going in to clean Sir Benny's chambers, m' lud."

"Not now, not now," said the old servitor sharply. "Clean this corridor first."

"Wery good, sir," said Holmes humbly. "This gennlemun was just askin' me to show 'im Sir Chummy's room. 'Is nyme is Dr. Watson, 'e says."

"Yes," I said, taking the hint from Holmes, "take me immediately to Sir Chummy's chambers, my good fellow."

"Right this way, Dr. Watson," suddenly called the voice of Inspector Lestrade. "Quick, you're just in time to save Sir Chummy from an operation by Surgeon General Carver of the Infantry.

In a room at the end of the corridor I saw a light burning, dashed in, and there on a couch lay Sir Benjamin Chummy-Chumley Foulois, looking very bored.

"Ah Watson, my good fellow," he cried, "I'm glad to see you. This knife business is becoming damn monotonous—they're always knifing me, confound them! Pull the pesky thing out, will you, and stick a bit of adhesive on my ribs.

"Ah, hah!" cried Sherlock Holmes, coming into the room and tossing aside his charwoman disguise. "So it was the General Staff who knifed you, eh? I suspected as much!" He turned on the old Quartermaster Sergeant who had followed us, tore the wig and make-up from the man's face, and said, "Come out from behind that disguise, Sir Douglas MacArthur, Bart.

Sir Douglas MacArthur—for it indeed was him whose chief claim to fame was that he had recently sued two Washington newspaper correspondents for $2,500,000 heart balm, on account of their writing something he didn't like—Sir Douglas looked miserably at Sherlock Holmes and said, "Mr. Holmes, could I have a word with you in private?"

"You can, Sir Douglas," said Sherlock Holmes, "but my friend Dr. Watson, who writes up all my cases, must be present."

"Very good," said Sir Douglas, bowing us toward a small room at our right. "Mr. Holmes," he said, "the true facts of this case must not come out until the political necessity that has forced me to this extreme measure is past. Mr. Holmes, this case concerns His Majesty, King Franklin I, Emperor, by the grace of God and Jim Farley, of our nation. As you know, the Air Mail Fiasco backfired on him and something had to be done to get him out of the mess before the next election.

"The natural goat would be Sir Chummy or myself, and naturally I object to being a goat. What was to be done? After all, Sir Chummy is used to being knifed by the General Staff; as Chief of Air Corps he has been knifed for years. Not that we have anything against him, mind you, but the Infantry, Cavalry, Artillery and our jobs must be protected against the Air Menace. Mr. Holmes, I've taken over the Air Corps, myself. Sir Chummy, who unfortunately will recover, will attend to patching up our old planes and buying erasers. Besides, we won't give him any money. In short, Mr. Holmes, we've got the Air Corps where we want it, in our own personal control, and we can guarantee that it will be a harmless and pleasant activity. In fact, if we get a good offer from Cliff Henderson, we may sell it to him as an added attraction for his National Air Races."

"Sir Douglas," said Sherlock Holmes holding out his hand, "you may assure His Majesty, King Franklin I, that he will hear no more about this case from me. You, Sir Douglas, have acted as I would expect a General Staff officer to act. Watson, our work here is ended. After the election I feel sure that even Sir Douglas will not object if you include this case in your published memoirs."

ADVERTISERS' LITERATURE SERVICE

AIRCRAFT

Literature on the following available to dealers, operators, private owners, business houses:

1. BEECHCRAFT — Four- or five-place, high performance cabin; 225 to 690 h.p...Page 63

2. FAIRCHILD — Two-place, open and three-place cabin, high wing .....Page 53

3. LAMBERT—Two-place, high wing, cabin; choice of several engines .....Page 67

4. LUSCOMBE—High performance, two-place, metal, cabin Page 60

5. TAYLOR—Two-place, high wing, tandem open cockpit, less than $2,000 .....Page 59

6. WACO—Complete line open and cabin planes, biplane models, wide range of engines. Page 65

Literature on the following available to United States and foreign airline operators and military authorities:

7. STINSON—A new trimotor-Lycoming airliner, 8 passengers and crew of two .....Page 7

8. BOEING "247D" — High speed, all metal, low wing, passenger, mail and express plane. Two engines; 10 passengers and crew .....Page 27

9. DOUGLAS—High speed, all metal, low wing, passenger, mail and express plane. Two engines; 12 passengers and crew..Page 9

10. GRUMMAN — Single engine, high performance Scout and Amphibion planes doing service in U. S. Navy...Page 1

11. CONSOLIDATED — Long range patrol flying boats, two engines, holders of non-stop over-water mass formation flight record .....Page 4

ENGINES

Literature on the following available to aircraft manufacturers, engineers, designers, airline officials and other users of high-powered aircraft engines, Army and Navy Officials, etc.—here and abroad:

12. PRATT & WHITNEY — Wasp and Hornet series air-cooled engines; direct drive, geared, supercharged. Second Cover

13. WRIGHT—Whirlwind and Cyclone air-cooled engines; direct drive, geared, supercharged; also Conqueror series, liquid-cooled engines .....Page 23

IMPORTANT

The literature of these advertisers is available only to those who are in the market for any of the products or facilities advertised in this issue. Read carefully, before filling out the coupon, the advertising of the items in which you are interested. Be sure to mention the company with which you are associated, and your position.

AIRCRAFT & ENGINE EQUIPMENT

Additional d r on the following available to manufacturers, engineers, designers, operators, repair stations, government air services, etc.; also to aircraft owners in the market for replacements:

14. ECLIPSE — Aircraft engine starters, generators, dynamos, landing gear motors. Back Cover

15. NATIONAL TUBE — National-Shelby seamless aircraft tubing; made to U. S. Army and Navy specifications ....Page 59

16. S K F—Dependable ball and roller bearings for important aircraft engine parts. Page 29

17. BERRY BROS. — Aircraft dope, lacquers, high grade finishes .....Page 70

18. B. G.—Spark plugs, mica; regular and radio shielded types. Page 2

19. THOMPSON—Intake and exhaust valves; hollow head and stem type, and cupped head and solid stem.....Third Cover

20. B. A. 30—Balloon and airplane cloth, made by Wellington Sears Co. Grade A, meets all Army and Navy spec...Page 65

21. WITTEK—"Noc-out" hose-clamps, with thumb screw, insure tight connections.....Page 67

22 EVANS — Aircraft fuel pumps; spring loaded flexible sylphon seal, flexible shaft, integral relief valve, wabble pump bypass .....Page 69

23 FLEETWINGS — "Shotweld" system stainless steel construction; "shotweld" stainless steel gasoline tanks.....Page 69

24. HAMILTON STANDARD —Controllable pitch steel propellers .....Page 25

25. KOLLSMAN—Precision aircraft instruments, individual direct lighting, clamp-type mounting .....Page 3

26. MACWHYTE—Streamline, square and round tie rods; cable; slings .....Page 55

27. HURLEY-TOWNSEND — "Cooled," radio-shielded aircraft spark plugs; all engines. Page 65

MISCELLANEOUS

The following companies will gladly send their literature to those who are interested in the particular products advertised:

28. IRVING—Irvin air chutes for Army, Navy, commercial and private fliers; also Irvin Chair Chutes for cabin planes. Page 55

29. PLANE SPEAKER—Complete equipment and operating rights of "Voice of the Sky" and Neon sign apparatus for sale to highest bidder.....Page 49

30. AIR ASSOCIATES — A complete line of winter flying clothes and miscellaneous aircraft and engine supplies....Page 59

31. AMERICAN—Steel sheets, the product of American Sheet & Tin Plate Co., for hangars, shops, sheds, culverts..Page 63

32. RONALD — The Ronald Press library contains 28 technical and non-technical aviation books of value to students, pilots, mechanics and engineers. Page 80

33. KELLETT—Aerial advertising; franchises available to qualified individuals or organizations. Page 65

34. N-B—Nicholas-Beazley offers complete line of winter flying clothing.....Page 70

SCHOOLS

School literature is available to everyone contemplating a course in aeronautical training:

35. AERO. UNIVERSITY — Bachelor of Aeronautical Engineering Degree; also master mechanics, pilots' ground courses, administration..Page 70

36. BOEING — Oakland, Calif. Courses include: Master Pilot, Special Master Pilot, Airline Operations, Ltd. Com. Pilot, Private Pilot, Amateur..Page 47

37. DALLAS — Dallas, Texas. Courses include all classes of pilot and mechanic training, aviation radio .....Page 8

38. CASEY JONES—Newark, N. J. Courses include: Aeronautical engineering, mechanics, instrument flying.....Page 68

39. LINCOLN—Lincoln, Neb. Courses include all grades of pilot, and mechanic....Page 67

40. PARKS—East St. Louis, Ill. Courses include: Executive Transport Pilot, Aeronautical Engineering, A & E Master Mechanics, Ltd. Com. Pilot, A & E Mechanics .....Page 5

41. RYAN—San Diego, Calif. Courses include: All grades of pilot and mechanic training; aerial navigation.....Page 61

42. ROOSEVELT — Mineola, N. Y. Courses include: Amateur, Private, Ltd. Com., Transport Pilot; regular and Master Mechanics .....Page 63

43. SPARTAN — Tulsa, Okla. Courses include: Flying, mechanics, radio-instrument, executive-management .....Page 51

44. STEWART — New York, N. Y. Specializes in airplane engine master mechanics. Page 67

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number.

CHECK HERE: Name.....

No..... Position.....

No..... Company.....

No..... Address.....

No..... City and State.....11-34

Books For Sale by the Aeronautical Library

GENERAL

A Rabbit in the Air. *David Garnett*.....$1.50
Aeronautics, A General Text on. *Hilton B. Lusk*.....$3.25
Andree's Story. *Edited by the Swedish Society for Anthropology and Geography*.....$5
Around the World in 28 Days. *Linton Wells*..$3.50
Aviation From the Ground Up. *Lieut. G. B. Manly*.....$3.50
Beauty of Flight. *Manfred Curry*.....$5
Flying. *James E. Fechet*.....$1
Heroes of the Air. *Chelsea Fraser*.....$2.50
Learning to Fly. *Capt. C. D. Barnard*.....$5.50
Learning to Fly for the Navy. *Lieut. Barrett Studley*.....$2
Little America. *Richard E. Byrd*.....$5
Mechanics of Flight. *A. C. Kermode*.....$2.50
Pseudo-Security. *J. M. Spaight*.....$5
Seaplane Solo. *Francis Chichester*.....$2.50
Strategy and Tactics of Air Fighting. *Major Oliver Stewart*.....$2.25
The Book of the Autogiro. *C. J. Sanders & A. H. Rawson*.....$1.75
The Book of the Sky. *Matthew Luckiesh, D.Sc*.....$3
The Conquest of the Atlantic by Air. *Charles Dixon*.....$2.50
The Far Horizon. *Henry Wysham Lanier*...$3
The Old Flying Days. *Maj. C. C. Turner*....$7.50
The Red Juggernaut (Nat'l Defense). *L. R. Maxwell*.....$1
The Sky's the Limit. *Lt. Tomlinson*.....$3.50
The Standard Airpost Catalogue. 1931-32 Edit..$2
The Story of Aircraft. *Chelsea Fraser*.....$2.50
The War in the Air. *W. Raleigh & H. A. Jones.*
Volume 1, 2, and 4, each.....$7
Volume 3 .....$9
The World in the Air. *Francis Trevelyan Miller* (2 volumes).....$15
Up. *Jack Stearns Gray*.....$3
Wings of Tomorrow. *Juan de la Cierva & Don Rose*.....$2.50
Wings for Men. *Frank Wead*.....$4
Wings Over the World. *J. L. French*.....$1

ELEMENTARY

A B C of Aviation. *Capt. V. W. Page* (new edition).....$1
A B C of Flight. *Laurence LePage*.....$1.50
Aerohatics. *H. Barber*.....$3.50
Elements of Aviation. *V. E. Clark*.....$3
Elementary Aeronautics. *A. P. Thurston, D.Sc.*$2.50
Elementary Aeronautical Science. *J. B. Hart & W. Laidler*.....$2.50
Elementary Laboratory Aerodynamics. *Arthur L. Jardan*.....80c
How to Fly. *Barrett Studley*.....$3
Manual of Flight. *Ienar E. Elm*.....$3
Practical Flight Training. *Lieut. Barrett Studley, U.S.N*.....$5
Practical Flying. *Byran Q. Jones*.....$3
Simplified Aerodynamics. *Alexander Klemin*..$3.50
Skyways. *General William Mitchell*.....$3
The Airplane. *Frederick Bedell*.....$3
The Complete Airman. *Capt. G. C. Bailey*....$5

DESIGN, CONSTRUCTION, OPERATION

Aeroplanes, Seaplanes and Aero Engines. *Capt. P. H. Sumner*.....$4
Aircraft Float Design. *Holden C. Richardson, M.S*.....$5
Airplane Mechanics' Rigging Handbook. *R. S. Harts*.....$3.50
Airplane Pilot's Mannal. *Ross Mahachek*.....$2.50
Airplane Welding. *J. B. Johnson, M.B*.....$3.50
Airplane Structures. *Alfred S. Niles & Joseph S. Newell*.....$5
Marine Aircraft Design. *Wm. Munro*.....$4.50
Metal Aircraft Construction (revised edition). *M. Langley* $4.50
Oxy-Acetylene Welders' Handbook. *M. S. Hendricks*.....$3
Procedure Handbook of Arc Welding, Design & Practice $1.50
Screw Propellers (3rd Edition, 2 Vols.). *Chas. W. Dyson*.....$5

ENGINEERING

Aerodynamic Theory. *W. F. Durand*.....$7
Airplane Stress Analysis. *Alexander Klemin*..$7
Dynamics of Airplanes and Airplane Structure. *J. Younger & B. Woods*.....$3.50
Elements of Aerofoil and Airscrew Theory. *H. Glauert* $5.60
Engineering Aerodynamics. *W. S. Diehl*.....$7
Fundamentals for Flnid Dynamics for Aircraft Designers. *Dr. Munk*.....$8
Handbook of Aeronautics. *Royal Aeronautical Society*. Vol. 1.....$7.50
Principles of Aerodynamics. *Dr. Max M. Munk*.....$1.75
Principles of Flight. *Edward A. Stalker*.....$6
Simple Aerodynamics and the Airplane (4th revised edition). *Col. C. C. Carter*.....$4.50
Stresses in Aeroplane Structnres. *H. B. Howard*.....$5

ENGINES

Aircraft Engine Instructor. *A. L. Dyke*.....$5
Aircraft Engine Mechanics Manual. *C. John Maors*.....$4.50
Aviation Engine Examincr. *Major V. W. Page*.$3
Automohile and Aircraft Enginrs. *A. W. Judge.* (Revised).....$10
Aviation Chart. *Lt. V. W. Page*.....30c
Diesel Handbook. *Julius Rosbloom*.....$5
Engine Dynamics and Crankshaft Designs. *Glenn D. Angle*.....$4
Handbook of Aeronautics, *Vol.* 2.—Aero Engines, Design and Practice. *Alexander Swan* $4.50
High Speed Diesel Engines. *Arthur W. Judge*.$4
Modern Aviation Engines. *Victor W. Page* (2 volnmes), *per volume*...$5
Set of 2 volumes.....$9
Modern Diesel Engine Practice. *Orville Adams* $6
Principles and Problems of Aircraft Engines. *Minor M. Farleigh*.....$3

FICTION

Night Flight. *A de St.-Exupery*.....$1.75
Sky Larking. Bruce Gould.....$2.50
The Right to Solo. *R. W. Kessler*.....$2
The Rise and Fall of Carol Banks. *E. W. Springs*.....$2.50
Wonder Book of Aircraft. *Harry Golding, F.R.G.S*.....$2.75

GLIDERS

A B C of Gliding and Sailflying. *Maj. V. W. Page*....Cloth binding, $2; paper, $1
The Book of Gliders. *E. Teale*.....$1
Gliders and Gliding. *R. S. Barnaby*.....$3

HISTORICAL

A Narrative History of Aviation. *John Goldstrom* $4
Beginning of Organized Air Power. *J. M. Spaight*.....$7
Evolution of the Flying Machine. Balloon: Airship: Aeroplane. *H. Harper*.....$5
Historic Airships. *R. Sargent-Halland*.....$4
Minute Epics of Flight. *Lumen Winter & Glenn Degner*.....$1
Sky High. *E. Hadgins & F. A. Mogoun*....$2.50
The Ingenious Dr. Franklin. *Nathan G. Gaadman*.....$3
The Problem of Vertical Flight. *Parlee C. Grose*.....$1.50
Wings Over Poland. *Kenneth M. Murray*....$3

INSTRUMENTS

Blind Flight. *By Maj. Wm. C. Ocher & Lieut. Carl J. Crane*.....$3
Instrument Flying. *Howard Stark*.....$2
Measurement of Fluid Velocity and Pressure. *J. R. Pannell*.....$4

LANDING FIELDS AND AIRWAYS

Air Conquests. *W. J. Davis*.....$3

LEGAL AND MEDICAL

Aeronautical Law, with 1933 Supplement. *W. Jefferson Davis*.....$12.50
Aircraft and Commerce in War. *James M. Spaight*.....$2.25
Aircraft and the Law. *Harald L. Brown, LL.B.*$3
Aviation Law—Made Plain. *George B. Logan, A.B., LL.B*.....$3
Aviation Law. *Henry G. Hotchkiss*.....$7.50
Law of Aviation. *Rowland W. Fixel*.....$7.50
National Regulation of Aeronautics. *Chas. C. Rohlfing, Ph.D*.....$3
The Law in Relation to Aircraft. *L. A. Wingfield, M.C., D.F.C., & R. D. Sparks, M.C*.....$5
U. S. Aviation Reports, 1932.....$10
Aviation Medicine. *L. H. Bauer, M.D*.....$7.50

MATERIALS

The Materials of Aircraft Construction. *F. T. Hill*.....$5
Manufacture and Use of Plywood and Glne. *B. C. Boulton*.....$2.25
Metallurgy of Aluminum and Aluminnm Alloys. *Robert J. Anderson*.....$7.50
Engineering Materials (Volnme I) Ferrous. *A. W. Judge*.....$8.50
Engineering Materials (Volume II) Non-Ferrous and Organic Materials. *A. W. Judge*..$7.50
Engineering Materials (Volume III) Theory and Testing of Materials. *A. W. Judge*....$6

MODEL AIRPLANES

Beginners' Book of Model Airplanes. *C. H. Claudy*.....$1.75
Building and Flying Model Aircraft. *Paul Edward Garber*.....$2.25
Complete Model Aircraft Mannal. *Edwin T. Hamilton*.....$3.50
Miniature Aircraft. How to Make and Fly Them. *O. H. Day & T. Vincent*.....80c
Model Airplanes. *Joseph Ott*.....$2.50
Prize Winners' Book of Model Airplanes. *C. H. Claudy*.....$3
The Skycraft Book. *Laura B. Harney*.....$1.85

NAVIGATION AND METEOROLOGY

Aerial Navigation & Meteorology. *Lewis A. Yancey* (new edition).....$4
Aeronautical Meteorology. (Revised edition). *W. R. Gregg*.....$4.50
Aircraft Radio. *Myron F. Eddy*.....$4.50
Air Navigation and Meteorology. *Capt. Richard Duncan, M.C*.....$3
Air Navigation for Private Owners. *F. A. Swoffer, M.B.E*.....$2.25
Altitude & Azimuth Tables for Air & Sea Navigation. *Collins & Roden*.....$2
An Analysis of Meteorology. *Harold Lewis Kirby*.....$4
Avigation by Dead Reckoning. *Captain Ienar E. Elm*.....$2
Cloud Studies. *A. W. Claydon, N.A*.....$4.50
Force of the Wind. *Herbert Chatley*.....$2
Line of Position Book. *Lt.-Com. Weems*....$2.50
Man and Weather. *Alexander McAdie*.....$2
Meteorology for Aviator and Layman. *Richard Whatham* $3
Navigation and Nautical Astronomy. *Capt. B. Dutton* $3.75
Simplified Aerial Navigation. *J. A. McMullen*.....$2
Simplified Time-Chart of the World. *Chas. M. Thomas*.....25c
The Navigation of Aircraft. *Logan C. Ramsey*.$4.50
The Navigation of the Air and Meteorology. *Capt. Leslie Potter*.....$4
Weather. *E. E. Free and Travis Hoke*.....$3
Weather and Why. *Capt. I. E. Elm*.....$2.50

PARACHUTES

Jump. *Don Glassman*.....$3
Parachute. *Charles J. V. Murphy*.....$2.50
Parachutes for Airmen. *Chas. Dixon*.....$2.50

PHOTOGRAPHY

Aerial Photographs. *Lt. Reeves, A.C*.....$5
Airplane Photography. *H. B. Ives*.....$4
Applied Aerial Photography. *Capt. Ashley C. McKinley*.....$5
Multiple Lens Aerial Cameras in Mapping. *Fairchild Aerial Camera Corp*.....$5

TRANSPORT & COMMERCIAL AVIATION

Economics of Air Mail Transportation. *P. T. David*.....$2
An Introduction to the Economics of Air Transportation. *Kennedy* $2
Principles of Transportation. *E. R. Johnson, G. G. Hubner and G. L. Wilson*.....$5
Transport Aviation (2nd Edition). *Archibald Black* $4

ELEMENTARY (GENERAL)

Dick Byrd—Air Explorer. *Green*.....$1.75
Everyman's Book of Flying. *Orville Kneen*..$3.50
Fighting the Flying Circus. *Capt. Eddie Rickenbacker*.....$2
Flying and How to Do It. *Assen Jordanoff*...$1
If You Want to Fly. *Alexander Klemin*.....$2.50
Riders of the Winds. *Edward Shenton*.....$2.50
Skycraft. *Augustus Post*.....$3.50
Skyward. *Commander Richard E. Byrd*.....$3.50
The First World Flight. *As related by the fliers themselves to Lowell Thomas*.....$5

BALLOONS AND AIRSHIPS

Aerostatics. *E. P. Warner*.....$4
Airship Design. *Charles P. Burgess*.....$9
Balloon and Airship Gases. *C. deF. Chandler & W. S. Diehl*.....$4
Free and Captive Balloons. *R. H. Upson & C. deF. Chandler*.....$5
Men Working. *Norman Beasley*.....$3
Pressure Airships. *T. L. Blakemore & W. Watters Pagon*....$8
Up Ship! *Lt. Comm. C. E. Rosendahl*.....$3

YEAR BOOKS

All the World's Aircraft. 1933—*Jane's*.....$14.75
Junior Aircraft Year Book for 1934.....$1.50

Prices Include the Postage

AERO DIGEST • 515 Madison Avenue • New York

Remit by Money Order or Check

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

SACRIFICE SALE

PLANES
ENGINES-PARTS

5 Fords
7 Fleetsters
4 Fokker F-10's

- Wasp Parts
- Hornet Parts
- Stromberg Parts
- Eclipse Parts
- Scintilla Parts
- Plane Parts
- Misc. Supplies

Detailed List and Price Furnished on Request

Transcontinental & Western Air
10 Richards Road
Municipal Airport
KANSAS CITY, MISSOURI

FOR SALE

AXELSON LINCOLN PAGE: Has been in storage, good condition, $400. J-5 motor, complete; $360. Two Wright Gipsy motors, complete, $250 each. One No. 89022 clutch change-over for J6-7, $100. J-5 prop, same as new, $90. Curtiss-Reed prop for Challenger, $50. J6-7 Curtiss anti-drag ring, $25. Folmer Graflex Model A-1 camera, $75. Set of 6.50 x 10 wheels, brakes, tires and tubes, $75. Set of 16 x 7-3 airwheels, tires and tubes, $28. Pistol, 2 flares and barrels, $70. Warner, Szekely motor parts. SM1B Stinson, Curtiss-Wright Travel Air and J6-7 Cessna airplane parts.

SIDLES AIRWAYS CORPORATION
Union Airport Lincoln, Nebraska

SUBSCRIBERS

When moving, please send your new address—together with the old—as soon as possible. Your attention to this detail will guarantee prompt receipt of your copies. Address the Circulation Department, AERO DIGEST, 515 Madison Avenue, New York.

BETTER AIRPLANES FOR LESS

Alexander Flyabout, Szekely 45, 2 PCLM..	$650
Bach Trimotor, 1 Wasp, 2 new J6-7 E engines	5,000
Bellanca Skyrocket, Wasp, perfect.....	7,000
Buhl Pup, Szekely 45, very good.....	425
Curtiss Fledgling, Challenger, "as is"....	575
Fleet, Model 2, overhauled K-5 motor....	1,275
Lockheed Vega, Wasp, absolutely perfect.	10,500
Monocoupe, Lambert 90, excellent.....	1,250
Monocoupe, Velie M-5, recovered.....	575
Sikorsky S-39, disassemhled, all parts available	
Stinson SM-7B, Wasp Jr., 280 hours total	3,000
Stearman, J-5, excellent condition.....	1,600
Travel Air monoplane, J-6, very good....	1,950
Travel Air, Challenger 185, steel prop....	975
Wallace Touroplane, Kinner K-5, 3-place..	975

We are now handling a complete line of new WACO Airplanes.

Write for details on any of the above listed airplanes.

Complete stock new and used engines, engine parts, propellers and all types aviation equipment.

AERO BROKERAGE SERVICE COMPANY
E. L. ERICKSON
LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA
"Selling the World Over"

FACTORY RECONDITIONED STINSONS ARE BEST

●

IF you are in the market for Used Planes, it will pay you to get our list of Factory Reconditioned Stinson Planes, powered by the reliable Lycoming Transport Motor.

Write for our list today

STINSON
AIRPLANE EXCHANGE
Stinson Airport, Wayne, Mich.

COMPER SWIFT—RACING PLANE
WINNER OF KING'S CUP IN ENGLAND
Single seater monoplane; NC licensed; 184 m.p.h.; 425 cu. in. Gipsy III engine; total time, 50 hours; $3,500.

D. H. PUSS MOTH. Three-place cabin monoplane; 105 h.p. Gipsy III; NC licensed; 130 hours; leather upholstery; dual controls; air wheels; brakes; wheel pants; folding wings; other extras; $2,750.

1934 STINSON RELIANT
60 hours; completely equipped, with flaps; landing lights and flares, radio and blind flying instruments. Excellent buy.

WACO CABIN, 1932. Excellent condition, just overhauled, $3,000.

STINSON SALES AND SERVICE
Barb-at Sales, Inc.
Hangar 17, Roosevelt Field, Mineola, N. Y.
Phone: Garden City 8888

CERTIFIED USED AIRPLANES

Wright J-5 WACO Taperwing, 75 hours since major. Wright J-5 WACO Straightwing, no time since major. Kinner BIRD, 125 h.p., 4-place; no time since major. WACO cabin, Continental 165 h.p. Lycoming STINSON SM-8-A; extras, Airwheels, etc. Wright J6-5 ARISTOCRAT, special finish; pants and ring. Wright J-5 TRAVEL AIR, semi-speedwing, 60 hrs. since major. Warner MONOSPORT, good condition. ARROW SPORT, LeBlond; speed ring, 200 hours total time. Hisso EAGLEROCK, factory rebuilt Hisso E. Szekely-powered CURTISS JR., 20 hours since major.

WRITE DR WIRE FDR PRICES

HOEY AIR SERVICES
Hangar No. 3 Floyd Bennett Field Brooklyn, N. Y.
Telephone: Nightingale 4-4200

---

3 Loenings—1 Pitcairn PA-7
All licensed and in good condition
Offered for immediate sale

LOENINGS priced at $2,000—$3,500—$4,000; PA-7—$2,250

Reasonable Cash Offers will be considered

Write or wire

PENNSYLVANIA AIRLINES AND TRANSPORT COMPANY
Allegheny County Airport, Pittsburgh, Pa.

AIRPLANES FOR SALE

Available for Immediate Delivery

5 Wasp Fords	Chicago	(Quotations upon request)
13 Lycoming Stinson Trimotors	Big Spring, Cleveland, Tulsa, Dallas, Nashville, Detroit.	$4,500 to $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit, Ft. Worth	8,500
4 Wright Cyclone R 1820 E Pilgrims	Cleveland, Albany, St. Louis	8,500
1 S-38-C Sikorsky Amphibian	Cleveland	11,500
1 Model "U" Stinson Trimotor	Cleveland	5,000
3 Wright J-6-9 Stearman 4CMI	Cleveland, St. Louis, Dallas	5,000

THIS AIRCRAFT is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.
Our quotation includes newly overhauled engines installed D.D.F. Chicago.
CASH OFFERS are requested to include newly overhauled engines installed and "NC" License.
In the event of export, all such shipments of aircraft will be covered by Export Airworthiness Certificates.
UPON REQUEST we will quote C.I.F. any desired Seaport or D.O.F. where now located.
Photographs to responsible buyers.

ALL BONA FIDE CASH DFFERS WILL BE CAREFULLY CDNSIDERED

American Airways, Inc., Sales Div., Municipal Airport, Cleveland, Ohio
Branch Office—Sales Division, 45 Vanderbilt Ave., New York City

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

DETROIT AERO MOTORS CO.

14019 Hamilton Ave. Highland Park, Mich.

FOR SALE—AIRCRAFT ENGINES: 1 late type 46 b.p. Szekely, $250; Continental A70-1, 165 b.p., $350; Continental A70-2, 165 h.p., $450; J6-6, 165 b.p., $350; J-5's, 220 b.p., $400; J-4's, $160; Wright Cyclone, Model E, 22 hrs. since major, complete with Standard Steel propeller and electric inertia starter, $850; 45 b.p. air-cooled motor, $65. 1 Ireland Privateer Amphibion, less motor, slightly damaged, $250.

WE BUY AND SELL AIRCRAFT ENGINES

ENGINE BROKERS

Hangar "B," Roosevelt Field, Mineola, N. Y.

FOR SALE OR EXCHANGE: Completely overhauled Wasp A—B—C—SID1—Wright J-5 and J6-5-7-9 cylinder A and D types—Continental 165—Challenger and Kinners.

FOR SALE: ONE ROBIN WING, NEW, RIGHT

Parts and Accessories Bought and Sold

Don Walling Wm. Wieland

Sacrifice Sale: Certified Used Ships

WACO MODELS A, F, F-2, C. Many extras. Trade or terms to responsible parties.

WACO SALES OF NEW YORK, INC.

Hangar 16, Roosevelt Field, Mineola, N. Y.

N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

WACO AIRPLANES

FOR SALE

HIGH CLASS USED AIRPLANES: Wacos, Lockheeds, Monocoupes, Birds; many others

Gov't approved Repair Station

Gov't approved Flying School

Ships for charter

ERICKSON & REMMERT, INC.

Hangar 6, Floyd Bennett Field Brooklyn, N. Y.

Telephone: Nightingale 4-2100

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale

The Vimalert Company, Ltd.

835 Garfield Avenue, Jersey City, N. J.

ENGINES

PARTS AND ACCESSORIES BOUGHT—SOLD

Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasse, etc. Also starters, generators, propellers, instruments, wheels and parachutes.

WRITE FOR PRICE LIST FRANK AMBROSE

AERO SALVAGE CORP.

Glenn Curtiss Airport, Jackson Heights, N. Y.

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

S. B. PROPELLERS

for

Aeronca E-107	Heath B-4
Aeronca E-113	LeBlond
Aeromarine 40	Salmson
Aeromarine 50	Szekely L
Cirrus Mark III	Szekely D
Cirrus Hi-Drive	Szekely Pusher
Continental A-40	Rover
Curtiss OX-5 & DXX-6	Velie
Wright Gipsy	Ford A

Approved by the Department of Commerce. Performance and satisfaction guaranteed. Carried in stock for IMMEDIATE delivery. For further details write or wire

SENSENICH BROS.

LITITZ, PENNA.

AERO ENGINES

Parts and Accessories Bought and Sold

Parts of all engines, 50% to 80% off list. Also complete engines, overhauled and in need of overhaul. Parts cheap. We have generators, control boxes, starters, instruments, flares, wheels, tires, propellers and anything and everything for an airplane. Slightly used bank and turn and rate of climb, $40 each. Wanted: Engines, instruments, accessories. Highest prices paid.

AIRCRAFT SALVAGE COMPANY

48-03 Ditmars Blvd., Astoria, L. I., N. Y.

selected clear aero sitka SPRUCE

For quick shipment from Chicago, rough or finished to exact size. For airplanes, gliders, iceboats, etc.

Lowest Wholesale Prices

Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.

Come to Us for Good Spruce

PIKE-DIAL LUMBER CO.

Airplane Lumber Specialists—2251 Loomis St., Chicago

We also carry "Plyco" aircraft plywood

BIRCH AND WALNUT PROPELLERS

Good performance - Accurate design - Tested materials - Guaranteed finish - FAIR PRICE! Marshall Propellers for all engines up to 165 h.p.

Manufactured by

MIDWESTERN AVIATION CORPORATION

Seymour, Indiana

AERONAUTICAL RADIO CO

ROOSEVELT FIELD MINEOLA N. Y.

Telephone Garden City 8770

Radio Shielding for all types of motors; Western Electric Aircraft Radio; Hurley-Townsend Radio-Shielded Plugs; Westport Aircraft Radio; Transmitting Equipment.

REAL QUALITY MERCHANDISE AT REAL BARGAIN PRICES

Complete list of Kinner K-5 and Warner engine parts; NAR-5A carburetor parts; instruments and accessories. All merchandise guaranteed to be in good condition.

Write or wire for price list

AVIATION SALVAGE COMPANY

6205 South Menard Ave. Chicago, Ill.

KINNER PARTS

VALVES—GUIDES—CAMS—PISTONS

MAGS—STACKS—AND SMALL PARTS

A small stock of NEW Parts bought at Bargain Prices and offered to our customers at BIG SAVINGS.

Write or wire

SUPPLY DIVISION, INC., Robertson, Mo.

San Fernando & Raymond - - Glendale, Calif.

LIEUT. W. G. HAWKINS

AIR-PARTS 70-85% OFF

A DEPENDABLE COMPANY

All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velie, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

FOR SALE

MISCELLANEOUS	PARACHUTES		ENGINE PARTS
34 Airplanes	Aircraft Cable	Travelair Parts—(Model 4000)	Wright Engine Parts—J-6-5, 7, 9, and J-5 Cyclone E, Gypsy
23 Engines	Radio Receivers	Stearman Parts—(C3B-C3MB-4CMI-LTI)	P & W Engine Parts Wasp B & C—Wasp Jr. Hornet A-A1-A2-B-B1-C
Lights—landing, navigation	Radio Parts R.C.A., W.E., S.C.	Pitcairn Parts—(PA5-6-7)	Kinner Engine Parts—K5-B5-C5
Fuel Pumps	Tools and Shop Equipment	Fairchild Parts—(FC2-FC2W2-71)	Ignition Harness Shielded and Unshielded
Generators G1-G2	AIRPLANE PARTS	Bellanca Pacemaker Parts	Spark Plugs
Oil and Fuel Line Fittings	Stinson Parts—Models "S" Jr., SM1-D, SM6-B, SM6000-B	Pilgrim Parts—(100A and 100B)	Magnetos and Parts
Oil Reclaimers	Ford Airplane Parts—5 AT		Carburetors and Parts
Safes	Fokker Parts—S.U. and F10A		
Instruments			
Starters and Parts			
Propellers and Parts			
Plywood (3-Ply Birch)			
Goodyear Airwheel Parts			

This is not a complete list. Additional equipment is being constantly received. Descriptive price lists mailed immediately upon request covering class of stock in which you are interested. Reasonable prices. New engine parts 50% off list—used parts 80% off list.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED

Please order by part number where possible

American Airways, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

FLYING ACES BUYERS' DIRECTORY

Circulation 63,220 A B C Guaranteed • 67 W. 44 St., New York • Rate $5 per inch in Advance

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

COLUMBIA "TECH"

Now Offers its FAMOUS RESIDENT COURSES
For Home - Study Instruction

No Educational Requirements to Enroll. Recognized for 25 Years.
Equipment and Texts Furnished without Charge.
Courses Completed in One Year or Less.
Free Employment Service—Also Local Classes.

COLUMBIA TECHNICAL SCHOOLS
A-D 1134 1319 F St. Washington, D. C

Without cost or obligation please send me information on course checked below:

ENGINEERING COURSES

( ) AIRPLANE DESIGN
( ) Aerodynamic
( ) Stress Analysis
( ) Electrical Eng.
( ) Machine Design
( ) Surveying and Mapping
( ) Steam and Gas Power Eng
( ) Refrigeration Eng.
( ) Building Construction Eng
( ) Heating and Ventilating Eng.
( ) Radio Engineering
( ) Architecture
( ) Highway and Bridge Eng
( ) Air Conditioning
( ) Landscape Eng.
( ) Civil Engineering
( ) Mathematics
( ) Mechanical Engineering

DRAFTING COURSES

( ) Mechanical Drafting
( ) Electrical Drafting
( ) Structural Steel Drafting
( ) Architectural Drafting
( ) AIRCRAFT DRAFTING
( ) Topographic (Maps)
( ) Patent Office Drafting
( ) Landscape Drafting

GENERAL COURSES

( ) Aircraft Blueprint Reading
( ) Mechanical Blueprint Reading
( ) Bldg. Const. Blueprint Reading
( ) Bldg. Const. Estimating

Name..... Age.....
Address.....
This School Does NOT Employ Salesmen or Field Representatives

RISING SUN AIRCRAFT SCHOOL, Inc.

PHILADELPHIA, PENNA.
MASTER MECHANICS COURSE
Autogiro, Airplane and Engines
DAY AND EVENING CLASSES

GOOD CUSTOMERS

"On the Market" will carry your advertising to some of the wealthiest families and individuals in the country—the people who fly purely for pleasure. They are the readers of THE SPORTSMAN PILOT.

"On the Market," which is somewhat similar to AERO DIGEST'S Buyers' Directory, is very economical—only $5 per column inch (two inches wide by one or more inches deep).

For additional details, write

THE SPORTSMAN PILOT
515 Madison Avenue New York, N. Y.

AERONAUTICS at STEWART TECH

Thorough—Technical and Practical Training Under Specialists. Complete Equipment—Large Workshops — Live Engine Testing Under Actual Flight Conditions. One- and Two-Year Courses in Master Mechanics and Aeronautical Engineering.

25 YEARS experience in training men for successful careers in the field of mechanics enables us to lay the proper foundation for you to achieve success in AVIATION. Visit the school or write for catalog.

STEWART TECH TRADE SCHOOL
Dept. 834L 253-5-7 W. 64th St. New York City

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS

Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering.

NEW YORK UNIVERSITY
UNIVERSITY HEIGHTS, NEW YORK, N. Y.

LEARN TO FLY AT
THE FINEST AIRPORT IN THE EAST
Up-to-date Equipment
Amateur Pilot's Course, $390; Private, $585
including ground school courses

Erickson & Remmert, Inc.
Approved Flying School
Hangar 6, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-2100

Amateur Course.....$185
40 actual flying hours; 10 hours X-country
Private Course.....$265
65 actual flying hours; 15 hours X-country

Stinson Airport School of Flying
One of the oldest established flying schools in the middle west
Joliet Road (U. S. No. 66) La Grange, Ill.

FLY IN FLORIDA

Sell that winter flying suit. Fly in comfort with sleeves rolled up and collar open.

KINNER FLEETS—$10 per hour SOLO
$13 per hour DUAL

Command-Aires and Stinsons for advanced training.
One hour free with each 10-hour cash enrollment by mail.

FLORIDA SKYWAYS, Inc.
Municipal Airport Miami, Florida

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

Landplane Airports, Seaplane Airports, Design, Supervision of Construction, Management Counsel, Transport Studies

A. P. TALIAFERRO, JR.* & COMPANY, INC.
Airport and Air-Transport Consultants and Engineers
101 PARK AVENUE, NEW YORK
*Formerly Chief of Airport Section, U. S. Department of Commerce, Washington.

STREAMLINES

Cowlings and Wheel Pants
Metal Spinning, Sheet Metal Specialties
HILL AIRCRAFT STREAMLINERS CO.
814-16 Reedy St. Cincinnati, Ohio

AERO BLUE BOOK

gives specifications of over 350 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Also present second-hand market value of popular ships. Only information of its kind ever compiled. Almost priceless to students, engineers, dealers and flyers. FREE! If you order now, your choice "How to Choose a Flying School" or "Points on Buying a Used Airplane." Send now!

NATIONAL DISTRIBUTORS, $1.00 postpaid.
822 Pine St., St. Louis, Mo.

Research Design Stress-Analysis

Manufacturing Flight-Testing Operations

GRANVILLE, MILLER & DE LACKNER
CONSULTING
AERONAUTICAL ENGINEERS
SPRINGFIELD AIRPORT, SPRINGFIELD, MASS.

STAINLESS STEEL TIPPED PROPELLERS

FLOTTORP PROPELLER CO.
1836 Linden Ave., S. E.
Grand Rapids, Michigan

50 BOOSTER MAGS @ $5
Bixle, overhauled, No. 132507. Real Buy.
RIEKER PITCH & BANK INDICATORS, $2.75
A useful and ornamental instrument.
JONES TACHOMETERS, new, $5
Parachute Harness for Irving, unused, $10 with all fittings for attachment.
J-5 Heater & Screen assembly, new, $12.
Specials for November only. Also, J-5 Parts; Wasp, Hornet, Cyclone; Tires, Wheels, Instruments, etc.
DYCER AIRPORT
9401 South Western Avenue Los Angeles, Calif.

ATTRACTIVE STORAGE RATES

for aircraft in modern fireproof hangars, $15 per month and up (dead storage $10 and up). Aircraft and Motor Repairs done at low cost. Why not drop in at Boston's Convenient Airport and get acquainted?

NATICK-WELLESLEY AIRPORT
Boston-Worcester Turnpike NATICK, MASS.

SPECIAL WINTER HANGAR RATES

50 minutes express service from New York. 5 minutes from railroad station. 200 acre lighted airport; modern fireproof hangars.

Ask for our winter rates.

AIRVIEW FLYING SERVICE, INC.
Red Bank New Jersey

N. A. C. A. Cowling Specialists

METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter

MAGOSY & BUSCHER
120-126 Walker Street, New York, N.Y.

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

J-5 RYAN, J-5 EAGLEROCK: $1,080 and $985. Both excellent condition. Licensed Octoher, 1935. Trades considered. Terms financed. Deliver anywhere for expenses. Dick Schall, Berwyn, Maryland.

WACO CABIN: 1934 model with Jacohs engine; special paint and other extras. Reasonahly priced; write for details. Wings Corporation of Philadelphia, Blue Bell, Pennsylvania.

WACO J6-5: Straight wlng. Motor completely modernized, total time 360 hours. Ship just recovered and painted. White fuselage and Stearman vermilion wings. Very attractive. Price $1,400. Will consider trade-in. Andy Stinis, Floyd Bennett Field, Brooklyn, New York.

USED AIRPLANE BUYER: Write wants, price range to "Pioneer." Their experience and connection at your service at no additional cost to you. Terms arranged. Pioneer Aircraft, Airport, Syracuse, New York.

LYCOMING STINSON: Retractahle landing lights; 2 Wiley flares; complete hlind flying instruments; full Airwheels, brakes. Motor and plane good condition; sacrifice, $1,000. Douglas Fonda, 175 Fifth Ave., N.Y.C. ALgonquin 4-8738.

AERONCA COLLEGIAN SEAPLANE: New last June, perfect condition; corrosion proofed, Edo pontoons, stainless steel wires and control cahles. Pioneer compass; motor, propeller and cockpit covers. Donald D. Cooke, Tenafly, N. J.

EAGLEROCK BIPLANE: NC-7E, Hispano 150 h.p. engine. Excellent condition. Newly refinished in red and silver. Edward H. Johnson, 64 Grand Street, Springfield, Mass.

LOOK—BARGAINS! Curtlss-Wright Jr., late model, new airwheels, wings reinforced, practically new engine, relicensed this month, $375. Arrow Sport, LeBlond 65, motor and ship just majored; new covering, very clean, just relicensed, $550. Also J-5 Wright cylinders with pistons, valves, rockers, etc., $12. Magnetos, $10. Carburetor, $10. Will make special price to parties interested in all my J-5 parts. Jack Lyndale, Mankato, Minnesota.

FOR SALE AT BARGAIN: Lycoming Stinson Reliant. Latest model. Purchased new July 10th. Leather upholstering. Equipped for night flying. Also equipped with speed arresters and honded for radio. A heautiful ship. Flown less than 50 hours. Edw. A. Forner, Jackson, Mich.

HEATH BULLET: $165. Wings, fuselage, tail surfaces, etc. $75 finishes plane. Built in approved shop. First offer taken. Nice clean joh. AERO DIGEST, Box 1916.

FAIRCHILD KR-34: 3-place open hiplane; licensed 1935; ship and motor perfect. 300 hours total time. $1,500 cash or trade for closed ship. Harold Potholm, 699 Broadview Terrace, Hartford, Connecticut.

CRACKED MONOPREP: '29, formerly licensed; repairahle except wing; motor Velie M-65; good shape, $200. First $25 deposit holds all. AERO DIGEST, Box 1906.

FLEET, WARNER: Just recovered and refinished in Berry finishes; steel propeller, airwheels, motor top overhauled short time ago; licensed for year. Recommended for anyone wanting safe and dependahle ship not requiring any additional expense. Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

THE FIRST $995 CASH takes this J6-7 three-place Spartan. 610 hours total time. 80 hours since major. Linen good. Never heen cracked. Licensed to January 15, 1935. Dees McDermott, P. O. Box 1655 Waco, Texas.

J-5 MOTOR: Just major overhauled. Perfect; complete with carhuretor and Scintilla magnetos. $400. Florida Skyways, Miami, Florida.

TRAVEL AIR 6000-B: Six-place monoplane, relicensed this month for year; motor, Wright J6-9, 330 h.p. Test hopped since major overhaul. Best huy in Oklahoma for $1,800. Joe Reed, Lawton, Oklahoma.

MONOPREP: Velie M-5. Licensed to July, 1935; excellent condition; duals, compass, air-wheels; $575 cash. Myers Aviation Co., Brackenridge, Pennsylvania.

KINNER AMERICAN EAGLE: Long nose; three-place; dual controls. Motor just overhauled and rewired. Very attractive; has red fuselage and silver wings; appears like new. 42-gallon gas capacity; cruises 85-90 and lands very slow. Licensed until April, 1935. A hargain at $895. Johnson Wright, P. O. Box 1551, Miami, Florida.

PITCAIRN AUTOGIRO PCA-2: Modernized Wright F, 330 h.p. Total time 250 hours, 20 hours since major overhaul. Relicensed Septemher first. Also complete sign-towing equipment, including 150 interchangeahle 9-foot letters. Both ship and signs in perfect condition. Nearest offer to $3,500 takes all. Want to hear from interested partles only. Frank Sagley, 1851 Eastern Parkway, Brooklyn, New York.

AERONCA: Two-place cahin; complete night flying equipment; compass, oleos, cahin ventilators; E-113A motor, perfect, $1,000 cash. Dan Henry, Hangar C. Roosevelt Field, Mineola, New York.

HENDERSON ENGINE with propeller, for light plane or hoat use. Good condition. Sell cheap, or trade for what have you? Chris Walton, 2830 Morgan, Tampa, Florida.

FOR SALE: Waco, side-hy-side Model A, Jacohs 170 h.p. motor. Total time ship, 470 hours; motor, 100 hours. Always privately owned. Extra equipment includes steel propeller, hank and turn, and shielding for radio. Offered at a sacrifice price for quick sale. No trades. Jack Gillies, Aviation Country Club, Hicksville, Long Island. Telephone: Hicksville 1013.

HUNDREDS OF USED PLANES: Crack-ups, $30 up; OX johs, $90 up. Send 20c for Directory containing owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

$1,500 LAMBERT MONOCOUPE: Excellent, many extras. 180 h.p. Hisso Travel Air: Excellent, extras, $950. OX-5 Challenger, excellent, $450. Dick Schall, Berwyn, Maryland. Telephone Berwyn, 332.

WACO F-2: Continental 165 engine. Recently major overhauled. Airplane and engine in good condition. Just relicensed. Cheap for cash. Troy Flying Service, Troy, Ohio.

FAIRCHILD 22: Excellent condition, $1,400. Fleet, Model 9, many extras, like hrand new. Jack Byrne Flying Service, Central Airport, Camden, New Jersey.

NEW CIRRUS H-D motor: $285. Used Cirrus H-D parts and 22 Fairchild ship, cracked. $150. Southwest Aviation and Service Corp., Braniff Building, Oklahoma City, Oklahoma.

BARGAINS: Stinson SM8A, condition A-1; SM8A parts; Lycoming engine parts; Curtiss Wright Jr.; low wing Jacohs Spartan; OX-5 Rohin. Vermilya-Huffman Flying Service, Lunken Airport, Cincinnati, Ohio.

WACO CABIN: '33 model; '34 Continental motor. Ship 160 hours, motor 30 hours. Bank and turn, rate of climh. Steel prop, new radio. Very clean; never cracked. Privately owned. Real sacrifice for quick sale. I. G. Johnson, 125 West 17th Street, New York, N. Y.

BEECHCRAFT: Jacohs; 2 months' service; 110 hours, perfect condition. Completely equipped, landing lights, flares, extra gas supply, directional gyro, sensitive altimeter, thermocouple, etc. Priced for quick sale. George W. McCauley, Aeronautical Radio Co., Roosevelt Field, Mineola, N. Y. Phone: Garden City 6770.

GREAT LAKES: Recently recovered; total time 300 hours; motor time since major overhaul, 30 hours. Air wheels, all Pioneer instruments, front cockpit cover, wing hutts, all fittings streamlined, inverted flying equipment, $875. American Eagle, Model 129, Kinner K-5 motor; Ship and motor perfect, $650. Driggs Skylark, Rover inverted 70 h.p.; ship and motor perfect, $550. Wanted: Stinson S or SM; must he cheap for cash. State condition and price in first letter. Minnesota Aviation Sales and Service Co., Municipal Airport, Minneapolis, Minnesota.

MONOCOUPE: "DeLuxe" Lamhert, with flaps. Special white paint joh. Two months old. Has electric starter and radio. Cost $3,725 two months ago. 36 hours, 15 minutes total time. We have just taken this ship in trade on a larger airplane. Will sell for $2,750. St. Louis Flying Service, Inc., Lamhert Field, St. Louis, Missouri.

STINSON JR.: Warner 125 h.p. 4-PCLM. Licensed, perfect shape, tail wheel, brakes, steel prop, motor recently majored, always hangared, $695. Trade smaller ship or terms. Gene Lawrence, Lehanon, Indiana.

REPOSSESSED CURTISS JR.: Few hours; factory reconditioned, including motor. Opportunity for quick sale. Ohtainahle small down payment; halance monthly. No time since complete reconditioning. Write Aviation Finance Co., Hemlock, New York.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

● PLANES AND ENGINES FOR SALE

FOR SALE: OX-5 American Eagle, in good condition, recently recovered. Must sell. A real bargain at $200. Gene Schattel, Harmleigh, Texas.

WACO C: Late model. Cadillac green. Flares, landing lights, hank and turn, rate of climh, steel prop, pants, Westport radio; beautiful ship; less than 100 hours certified time. Must sacrifice. H. W. Bresee, 650 S. Salina St., Syracuse, New York.

MODEL S STINSON: Excellent condition, fully equipped; starter, rate of climh, turn and hank, flares and landing lights, radio. Special paint joh. Price, $2,200. Aeronca C-3 like new; total time 275 hours. Licensed to June, 1935. Price, $1,200. Inter City Flying Service, Fort Wayne, Indiana.

FLEET, KINNER K-5: Completely rehuilt May, 1934; full sized airwheels, brakes, Eclipse air starter; leather upholstery; steel propeller. Must he seen to he appreciated. $1,500. Lowell White, Caldwell-Wright Airport, Caldwell, N. J. Phone: Caldwell 6-1560.

FOR SALE: Siemens Kitty Hawk, three-place; major overhauled; new covering; Scintillas, Airwheels, new prop; excellent condition; price, $850 or trade for Taylor Cuh or Aeronca. Also J6-5 Challenger KR-34, A-1 condition, $1,350. Jennings Bros., Danhury, Connecticut.

GIPSY MOTH: Perfect condition, 60 hours since complete motor overhaul. Plane just completely recovered. Bargain, $700. Douglas Fonda, 175 Fifth Ave., New York, N. Y. Algonquin 4-8738.

WACO F: Warner 125, excellent condition. Starter, compass, airspeed, hall hank; $1,750. Travel Air Challenger with extra equipment, $1,150. Standard J-5, 75 hours since rehuilt, hand ruhhed finish, $2,250. Monocoupe Lamhert, $1,450. Also Waco A, 170 hours total, extras. Leech Aircraft, Inc., Westchester Airport, Armonk Village, New York.

FOR SALE: Travel Air 2000; OXX-6 motor; metal prop; lowers recovered and licensed; $350. H. J. Larkin, 206 Corey Road, Boston 47, Mass.

LOENING COMMUTER amphihion: J-6 300. With or without motor. Electric starter, generator and hattery included. Aviation Country Club, Mt. Prospect, Illinois.

LAMBERT CAVALIER: Latest two-place cahin. Finished and equipped for show purposes. Gloss white, red trim. NACA cowling, pants, metal prop, hrakes. 220 hours. C. F. Williams, Miami, Oklahoma.

FOUR-PLACE CABIN J-5 Stinson, excellent condition, $1,250. Kinner Monocoupe, like new, $1,150. Kinner Monosport, like new, $950. Damaged American Eagle, all or parts. New K Kinner, $275; exchange. New K Kinner, majored, $200; exchange. J. E. Blythe, 1108 East Admiral, Tulsa, Oklahoma.

FOR SALE: Spartan 3 POLB; Walters 120 h.p. Etched prop, new tires. Ship licensed and in good condition. Motor in excellent shape. $700 or trade for Aeronca, Great Lakes, Fairchild or Fleet. Bill Bowerman, Memphis, Texas.

FOR SALE: Travel Air W-4000, Warner, 125 b.p.; steel propeller, air wheels, excellent condition, licensed, $1,100. Johnson Flying Service, Missoula, Montana.

TAYLOR CUB: Aeromarine motor, less than 100 hours total since hrand new; $1,000 cash. Aeronca C-2, just recovered, refinished, new windshield, prop, factory fitted cylinder assembly, airwheels, licensed for one year, only 9 hours time; $450 cash. S. F. Sapp, Albany, Georgia.

$700 TRAVEL AIR: Siemens-Halske 125 h.p. Licensed until Octoher '35; metal prop. Recovered; always hangared; never cracked. Little time on motor. C. W. Kessler, Jr., Ehenshurg, Pennsylvania.

TRAVEL AIR OX-5: Recently recovered, newly overhauled motor, special instrument panel, licensed until Septemher, 1935. Best Travel Air in middle west. In perfect condition. $685 cash, including spare motor. Manager, County Airport, Muskegon, Michigan.

FOR IMMEDIATE SALE OR EXCHANGE: 11 certified airplanes, as follows: J6-9 330 h.p. 6-place Stinson cahin ship, with air wheels; J-5 B-1 5-place Ryan cabin ship; J6-5 175 h.p. 3-place Curtiss Robin cahin ship; J-5 3-place Travel Air, late type; J6-9 330 h.p. straight wing Waco; J-5 Waco; J6-7 250 h.p. straight wing Waco; Kinner-powered Stinson cahin ship; OX-5 Waco 90; OX-5 Travel Air; Wright Cyclone-powered 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean husiness. Will accept good late model cars on deals. Terms to responsihle huyers. Becker-Forner Flying Service, Inc., Jackson, Michigan.

FOR SALE: J-5 Waco; J-5 Standard with night flying equipment; J-5 engines. Milton Hersherger, Put in Bay, Ohio.

TRAVEL AIR 2000: Licensed Septemher, 1935. High compression OX-5, turns 1,400 on ground with high pitch prop. Will get out and go. Ship, motor just overhauled. $500. M. B. Ronald, Mitchell. South Dakota.

SACRIFICE: Must sell to settle estate. J6-5 American Eagle, privately used, always hangared. Approximately 240 hours total time. Perfect condition. Licensed. Cruises 100. Tops 120. Speed ring, tail wheel, hrakes, compass, airspeed, navigation lights. Clear title. First $750 takes ship or nearest cash offer. Jack Covington, Rockville, Maryland.

FIVE-PLACE STANDARD D-25: Completely overhauled, redoped and painted; J-5 engine has total of 288 hours, 15 hours since overhaul; all set for work, $1,625. Travel Air 4000 J-5, completely overhauled, wings and fuselage recovered; special hlue-orange paint job; speed ring, Airwheels, hrakes, steel propeller, engine 37 hours since major overhaul; $1,265. Fred Moller, Stratford, Connecticut.

WASP C 420 h.p. Stearman 3-place, just relicensed; radio, lights, covering excellent, Pratt Whitney overhauled motor, $2,500. Wright J6-7 240 h.p. Stearman 3-place, licensed to March, 1935; landing lights, covering excellent, $1,375. Wright J6-5 165 h.p. 4-place cahin Stinson, $950. Edward F. Booth, Inc., Hangar 1, Love Field, Dallas, Texas.

BACH TRIMOTOR: Ten-place transport. Wasp and 2 Kinners. Starters. Top 152, cruises 127. Privately owned, used 300 hours. Condition same as new. Ready for service. Price $5,800. Vic Peters, 975 So. Oxford St., Los Angeles, Calif.

TRAVEL AIR OX-5: Scintilla magneto, semi-Millerized, fully equipped including Russell seat pack. Best cash offer accepted. Excellent condition, licensed. AERO DIGEST, Box 1904.

WACO F-2: Continental 165; excellent condition; 460 hours, 100 since complete overhaul; just relicensed. Townend ring, steel propeller, airwheels and hrakes, navigation lights, starter. $1,900 or will trade on smaller plane. Morgan Herr, Harrishurg Airport, New Cumherland, Pennsylvania.

MONOCOUPE: Velie; will fly anywhere. Is equipped with heater, wheel pants and clock. Sacrifice at $350. Consider delivery truck on trade. Donald Fulton, 136 Wills Ave., Akron, Ohio.

FOR SALE: Szekely Eaglet, excellent condition, 300 hours, extra set of pistons and pair ski. Cheap. Taylor Cuh, flown 190 hours, ship excellent condition, with Continental engine with hroken crankshaft. Will sell right. Jesse Jones, Lancaster, Pennsylvania.

JACOBS TRAVEL AIR: A fine ship, never cracked. Complete instruments, hrakes, airwheels, metal prop, hood cowl. In good condition except fahric, which needs recovering. AERO DIGEST, Box 1918.

OX-5 TRAVEL AIR for sale or trade. Millerized, dual ignition, licensed to July, 1935; A-1 condition. George Knapp, 1123 Brockway, Saginaw, Michigan.

USED PLANES: J6-7 Cessna in excellent condition at hargain price. Completely rebuilt three-place B-5 Kinner Bird with special equipment. Also Lamhert Monocoupe, Fairchild 22, Mead primary glider with automohile trailer. Write for full particulars. Airport, Natick, Massachusetts.

STINSON: Lycoming. Licensed last week for a year. Good condition. Special green leather upholstery. Extra gas tanks give long cruising radius. $1,575. St. Louis Flying Service, Inc., Lamhert Field, St. Louis, Missouri.

LAMBERT MONOCOUPE: Heated cahin. 25 hours since majored. Steel prop, ring, tail wheel, lights, rate of climh, hank and turn; entire ship perfect condition; always waxed, like new. Must he seen to he appreciated. Bargain, $1,650. George Vaughan, Jr., 1336 E. Montgomery Ave., Philadelphia, Pennsylvania.

185 H.P. CHALLENGER ROBIN: Now heing top overhauled; full instruments, including hank turn, rate of climh, etc. Special V windshield, tail wheel, hrakes, safety glass throughout. Will consider a trade. Southern Flying Service, Inc., 550 Arlington Road, Roanoke, Virginia.

FAIRCHILD 24: 1934. With sport landing gear. Latest type Warner motor, 125 h.p. 180 hours. Privately owned, priced low. Four-place Cessna, J6-7 motor, $1,750. Will trade Stinson. OX-5 Challenger, $700. All ships licensed and in good condition. Newhouse Flying Service, Princeton Airport, New Jersey.

TWO BULL PUP airplanes for sale; 185 hours and 350 hours; excellent shape, overhauled motors, few extras; licensed, no trades. Priced for quick cash sale. Write or wire Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

FOR SALE: J6-9 330 h.p. 6-place Stinson cahin ship. Excellent condition throughout. No reasonahle offer or proposition refused. Terms to responsihle huyers. Michigan Aero Motors, Jackson, Michigan.

LYCOMING STINSON: Licensed to August; covering good as new, never cracked, motor recently majored; has speed ring, leather upholstery, new tires and hattery. Price $1,450. Kenneth Wright, General Delivery, Bradford, Penna.

FOR SALE: Stinson Jr., cracked, needs recovering and ribs in wings. Spars okay. Motor just overhauled. Complete with prop, speed ring and starter. Will sell ship or engine. Make offer. Will trade on another ship. Frank Gore, Jr., 9142—121 St., Richmond Hill, L. I., New York.

J-5 PITCAIRN: Just relicensed. Dual controls and instruments; night and hlind flying equipment: hood, flares, radio, cockpit phones, speed ring and airwheels. Price, $1,475. Walter C. Hartman, 4061 Vinceton Street, Pittshurgh, Pennsylvania.

K-5 KINNER American Eagle: Airwheels, steel prop, looks and flies like new, $1,250; consider trade. One pair 20 x 9 x 4 airwheel tires. One pair 30 x 5 Bendix wheels and tires with complete brake assemblies; A-1 condition. Will trade 1934 Plymouth 4-door sedan, still on show floor, or cash, for plane. No OX; consider wrecked Waco cahin. Lombard Airport, Inc., Lomhard, Illinois.

CURTISS ROBIN OX-5: Excellent condition, duals, compass, air speed, $395. Will take automohile as part payment. Stewart Motor Trucks, Inc., 933 Franklin Avenue, Brooklyn, N. Y.

TRAVEL AIR 2000: Licensed till June, 1935. New fabric. OX-5 motor in good condition; Millerized. $475 cash. Ervin Boldt, Norfolk, Nehraska. Route One.

THREE USED SHIPS in excellent condition: Keystone Commuter amphihion (35 hours since new); J6-5 Challenger. Wanted: Stinson S left wing or will sell same complete hut less this item. For further information or inspection: Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

LYCOMING R-680: Completely overhauled, new type cranksbaft, new rod hearing, $750. Steel propeller for this engine, etched, polished, $95. Jerry Kelsey, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

REARWIN JUNIOR with late type 45 Szekely. 2-place monoplane. Like new. Winter enclosure. Licensed till August, 1935. $750. Monty Barnes, Municipal Airport, Wichita, Kansas.

FOR SALE OR TRADE: Great Lakes de luxe Trainer, OX-5 Challenger, Curtiss-Wright Jr., American Cirrus engine, major overhauled. Aero-Ways, Inc., Cleveland Airport, Cleveland, Ohio.

WACO 10: First class condition. Just licensed. Cheap for cash. Extra motor. Elmer Erickson, Whitney Point, New York.

PLANES AND ENGINES FOR SALE

VELIE MONOPREP: Licensed, $595. Motor completely overhauled recently. Economical operation outstanding feature for student training and huilding up time. Ship at Roosevelt Field. Floyd Brink, 155 E. 44th St., Room 801, New York, N. Y.

KINNER (Special Sportwing): 125 h.p., licensed until June, 1935. New, and only 60 hours total time. Fast cruising and slow landing. Eight gallons per hour. Equipped N.A.C.A. cowling, pants, brakes, starter, radio compartment; shielded for radio, etc. Cost $4,000, June this year. Best offer over $2,500. Would consider terms if adequately secured. Can he seen in East any time. Better act quick. AERO DIGEST, Box 1909.

$475 BUYS WARNER STINSON cahin: Motor needs repair; licensed to Septemher, 1935; steel propeller, many extras. Curtiss Junior, $375; Waco 10, less covering, $185. "Pioneer," Airport, Syracuse, New York.

AMERICAN EAGLE: Kinner, steel prop. Slightly damaged, $400. Will arrange trade on good OX. Low price on rehuilt OX and parts. Approved sign release. Mayer Airport, Box 252, Bridgeville, Pennsylvania.

FC-2W Fairchild 57 pontoons, good as new, complete with struts and wires, rudder fittings. Used 2 hours only, in fresh water. $750. Chalk, 368 N.E. 57th St., Miami, Florida.

WACO F-2: Excellent condition; lots of extra equipment, including special paint joh. Write for details. Wings Corporation of Philadelphia, Blue Bell, Pennsylvania.

STINSON LYCOMING: 1933 Model R. Excellent shape. Lots extras. Red leather, etc. $2,950 or trade on good farm or hungalow. Dr. Haynie, Fremont. Nehraska.

TAYLOR CUB: Factory rehuilt like new; latest improvements; 100 hours. Continental motor, new type, 190 hours. Licensed September 1935. Terms. Patterson, 221 Melhourne, Detroit, Mich.

ALL METAL four-place Buckley, low wing monoplane, less motor, $400. Licensed with 300 h.p. motor. Curtiss Wright Jr., good condition, licensed, motor only 38 hours, $350. Deats Aviation Service, Grand Island, Nehraska.

CURTISS JUNIOR: 45 h.p.; new type Szekely cylinders. 10 hours since complete overhaul. $350. Alexander Loeh, 230 West 99th Street, New York, N. Y. Riverside 9-6547.

TRAVEL AIR E-4000: Like new throughout. Recovered, finished International orange and Travel Air hlue. Powered Wright J6-5, modernized; major overhaul 60 hours hack. Bendix wheels and brakes, new tires. Licensed; never cracked. Must he seen to he appreciated. Exceptional huy, cash. Will fly anywhere for expenses. Smith Flying Service, Clarkshurg, West Virginia.

FOR SALE: 5-place Standard; J6-7 with clutch. Model D-25-A. Last Standard huilt. Finest condition. AERO DIGEST, Box 1912.

EASTMAN FLYING BOAT: Damaged, with Challenger engine, steel propeller, dual Dep. controls, dual instruments, air starter. Wings and hull need repairing; will make dandy ship for mechanic to repair and put in flying condition in spare time. Eastman parts availahle through us. First $325 takes the Eastman. Located in Central West. Write or wire AERO DIGEST, Box 1913.

KINNER K-5 AMERICAN EAGLE: Model 201. Like new. No time since major overhaul; air wheels, navigation lights; licensed July 1935. $700. Archie MacDougall. Pemhina, N. Dak.

FOR SALE: Cash only. Waco F-2, 165 h.p. Continental; Waco A, 170 h.p. Jacohs, excellent condition. No reasonahle offer refused. AERO DIGEST, Box 1911.

J-5 STEARMAN: Total time 425 hours. Motor has 50 hours since complete major overhaul. Ship recovered recently. Special hand-ruhhed gloss finish. Equipped with large semi-airwheels, starter, front cockpit cover and Townsend ring. Price, $1,300. Will consider trade-in. Andy Stinis, Floyd Bennett Field, Brooklyn, New York.

CHALLENGER ROBIN in excellent condition. Bendix wheels and brakes. Pioneer compass. A hargain at $975. Will consider trade on small ship. Earl Gustafson, Marinette, Wisconsin.

CIRRUS ENGINES (English Mk. III) 97 h.p. at 2100 r.p.m. Brand new, $250. Suitahle Avian or Great Lakes. Licensed. N. W. Perdew, Hashrouck Heights, New Jersey.

NEW STANDARD KINNER 5: 19-stud, side exhaust. 25 hours since major overhaul. Recovered recently. Dual controls, dual instruments. New General streamline tires with hrake wheels. Licensed; $1,150. AERO DIGEST, Box 1914.

FAIRCHILD KR-31: OX-5. Newly recovered and motor overhauled. Ship in perfect condition, $550. G. Meyers, H and Lycoming Sts., Philadelphia, Pennsylvania.

STINSON: 6-place model SM-1DA, J-5 engine. Fuselage, oleos and propeller damaged. Other parts in good condition. Will sell whole plane or parts cheap. Donald Hood, Northampton, Massachusetts.

TRAVEL AIR SPORT: 3-place, 165 Wright engine; electric starter and other extra equipment. A hargain at $1,600. Wings Corporation of Philadelphia, Blue Bell, Pennsylvania.

FAIRCHILD 22's, Warner, Cirrus and Gipsy; 24's, Warner and Cirrus. Fleet, Fokker Super Universal, Lockheed Vega, Wasp Laird, Warner and Lamhert Monocoupe, Stinson Jr., Reliant, Travel Air 6000, Stearman, Waco C, Great Lakes, Stinson trimotors, Bellanca Skyrocket. Aircrafe Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

LAIRD J6-9 SPEEDWING: Entirely rehuilt hy leading manufacturer. Beautiful copper and silver finish. Wires and struts chromium plated. All instruments, including hank and turn and rate of climh. Landing lights. Perfectly streamlined. Adapted for stunt flying. No time since major overhaul. Attractive price with or without engine. AERO DIGEST, Box 1915.

BARGAIN: Ryan B-1, J-5; licensed, new cover. Engine A-1 condition. Special walnut interior. Arrow Sport, LeBlond 65: Few hours, perfect condition; licensed. Cash or trade. Boh Curry, Seymour, Indiana.

TAYLOR CUB A-40-2: Recovered, streamlined fuselage painted hlue and red, Stinson effect on wings, heater. Price $800. A. L. Matthews Repair Station, Schenectady, N. Y. Airport.

OX-5 CHALLENGER: Miller action, factory recovered, 800 hours on ship, 140 hours on motor. Good flying condition. $350 cash. Henson Flying Service, Hagerstown, Maryland.

SELL OR TRADE: Licensed 8-place Wasp Stinson in perfect condition. No reasonahle offer refused. Jack Faulkner, 528 Avon Road, West Palm Beach, Florida.

TRAVEL AIR JACOBS: 170 h.p.; heautiful flying ship. Metal prop. N.A.C.A. cowl. Rate of climh, turn and hank, clock, hrakes, soft tires. Never cracked; motor overhaul and complete recovering in process. Will finish to huyer's specifications. An ideal personal airplane. $1,600. The Viking Flying Boat Co., New Haven, Connecticut.

OX-5 COMMAND-AIRE: Recovered this spring, licensed to July, '35. Excellent condition. Best hargain in Ohio at $425. No trades. AERO DIGEST, Box 1919.

TRAVEL AIR J-5: 460 hours. Licensed to February, 1935. Also landing gear, speed ring, steel propeller. Curtiss-Wright Jr., excellent condition. Air Activities Airport, West Chicago, Ill.

FOR IMMEDIATE SALE OR TRADE: Slightly damaged J-5 B-1 Ryan, completely recovered recently. Located in Northern Ohio. Write or wire Michigan Aero Motors, Jackson, Michigan.

ARISTOCRAT: Warner 125 h.p. Ship in excellent condition. Major overhaul on motor. New covering. Special paint joh. Price $1,350. George Rufle, 3285 33rd Street, Astoria, L. I., New York.

MISCELLANEOUS PRODUCTS AND EQUIPMENT

DON'T THROW your B-5 heads away even if they are cracked. We repair and reinforce them hetter than new. K and B-5 front cases reinforced hy our new method, guaranteed 300 hours. Prompt service. Valve guides installed, $1.50 per guide, lahor and material. Expert workmanship. Air Transport Equipment, Inc., Roosevelt Field, Garden City, New York.

FOR SALE, PARTS: Szekely 45 h.p. parts; Great Lakes parts; Waco 10 parts; Warner engine parts; Waco F cockpit cowling; Barling N-B parts; J-5 parts; OX-5 parts. Airplane for sale: J-5 Waco Taperwing, $1,200; licensed August, 1935. Address Municipal Airport, Blackwell, Okla. Care of C. Bradfield.

WINGS: Large stock replacement wings ready to ship. Laminated, routed and plain spars. Shipped promptly on order. Also rihs. Chicago Aviation Corp., Glenview, Illinois.

ROBIN PARTS: 60-75% off list price. New and used axles, struts, wires, fittings; used cowling, oil and gas tanks, control surfaces, etc. Also few Command-Aire and Moth parts. Challenger engine parts. Write for prices. Baltimore Flying Service, Inc., Baltimore, Maryland. Operating Curtiss-Wright Airport.

FOR SALE: Late Velie M-5 parts; cylinders, rods, crankcases, magnetos, etc. Also late type Velie Monocoupe parts. Very reasonahle. O. W. Deutsch, Hartford, Wisconsin.

ANNOUNCING NEW MODEL Wasp-Hornet rocker arm depressor, light hut powerful; works from front of engine; will not slip. $3, prepaid. Satisfaction guaranteed or your money hack. Air Transport Equipment, Inc., Roosevelt Field, Garden City, New York.

PROPELLERS: Lowest prices in the country. Steel props for J-6, J-5. A few hrand new Hamilton wood props at $15. We stock Flottorp, Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

HISSO A EAGLEROCK: Late covering, recent major. Dual instruments. Good used Kinner K-5 parts: Head assemhly, side exhaust, sixteen-stud, $15. Head, $10. Rear crankcase cover, $15. Valves, $1.25. Rocker hoxes, 75c. Cam shaft, $1.75. Cam follower assemhly, $1. Oil pump assemhly, $6. Magnetos, Scintilla, excellent, $18. Push rods, $2.75. Stromherg carhuretor, $15. OX-5 parts most reasonahle. Renfro Airport, Hereford, Texas.

BUHL PUP PARTS: Recently purchased complete Buhl Aircraft inventory enahles me to offer Buhl Pup parts at ½ price. Karl Ort, 588 W. Poplar Street, York, Pennsylvania.

GENUINE U. S. NAVY $10 calf leather helmets, chamois lined, nutria fur interlined, $1.95; large sizes only. Warm flying suits, hlanket lined, $16.50 up; new fresh stock. Celluloid sheets, 1/16", 3/32", 1/8", 50% discount. Full line replacement parts for all motors at hig savings. Send us your inquiries and orders. Air Transport Equipment, Inc., Roosevelt Field, Garden City, New York.

SEMI-AIR WHEELS: 6.10 x 10 Goodrich semi-air wheels with hrakes. Excellent condition. $75. Chicago Aviation Corporation, Glenview, Ill.

ALL PARTS SAVOIA S-31: All fittings and wires chromium. Have left wings, tail group, landing gear, instruments and other parts. Kinner B-5, complete. Heywood starter. Make offer. Richard Life, Parkershurg, West Virginia.

RECONDITIONED J6-9 PARTS: Cylinders, $22.50, nine for $150. Clutch, $40. Impeller, $30. Cam, $40. Crankshaft, $70. Master rod, $40. Link rods, $5, nine for $35. Main section, $80. Tappet and guide assemhly, $5. Rocker arms, $3. Exhaust manifold, $30. Florida Skyways, Miami, Florida.

LYCOMING MOTOR: cracked-up J6-9 Laird, Fairchild parts; radio shielding for Lycomings, Westport radio. Aircraft Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

LOWEST PRICES: J-5, Hisso parts. Eaglerock, Travel Air 4000, Eagle wings. LeBlond Klemm installation. Starters, parachutes, propellers, instruments, camera, new 32 x 6 Bendix wheels. Want Pitcairn fuselage. Want J-5 joh, less motor, any condition. AERO DIGEST, Box 1910.

WING EXCHANGE: Trade your wrecked wings for rehuilt or new ones. We also have spars, rihs and struts. New London Aircraft Co., New London, Ohio.

SPECIALS FOR SALE: Edo floats; Aeronca seaplane, four months old; J6-5, overhauled; parts Travel Air 4000-E; Lycoming Stinson. International Aeronautical Salvage Co. (airplanes, engines, parts and accessories hought and sold), 960 Newark Avenue, Jersey CIty, New Jersey.

EAGLEROCK and J STANDARD parts: Sell or trade. Two toothpick, one Paragon propeller. Trade OX valve regrinding and reseating for what have you. Used planes hought, sold and traded. Peter Bryn, Hannaford, North Dakota.

FOR SALE: New uncovered Ryan B-5 fuselage, less gear and empennage. B-1 and B-7 spars, Ryan gas tanks, Ryan B-1 lift struts and ailerons, B-5 elevators. Hamilton propellers for J-6 Lycoming and Continental, Heywood and Eclipse starters. Also manufacturers' stock of essential ship parts and supplies. Prices right; tell us your needs. Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

CLEARANCE SALE: Bargains in ships, fuselages, wings, tail surfaces, engines, propellers, instruments, fahric, dope, flying suits, helmets, goggles. Write us your needs. Williams-Raithel Aircraft, Gill, Massachusetts.

MISCELLANEOUS PRODUCTS, ETC.

KINNER K-5 100 h.p. parts for sale: Front exhaust heads. Also two Cessnas, Waco F and Fleet. Hyannis-Falmouth Airports, Inc., Hyannis, Massachusetts.

FAIRCHILD 22 LANDING gear; Hamilton metal prop complete for 145 Warner, Jacobs or Kinner; Westport Senior Radio with Breeze shielding complete; Monocoupe latest type wheel pants; Warner-OX5-Gipsy metal prop hub; Eclipse starter and battery complete for Warner 145; Monocoupe tail wheel assembly complete. Aircraft Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

FOR SALE: B-5 Ryan wing, like new, covered, $300. J-5 engine, 130 hours since major by American Airways, $200. Roger Mensing, 1218 Jones St., Fort Wayne, Indiana.

WANTED TO BUY OR TRADE

WILL TRADE: Practically new $4,500 Continental C-5 racing car for any licensed 3-place airplane or Packard touring car or roadster, 1931 model or later. Saucon Valley Skyways, Box 204, Bethlehem, Pennsylvania.

HAVE CASH FOR good Lycoming motor, propeller and starter. Give full description, hours and best price at once. Michigan Aero Motors, Jackson, Michigan.

WANTED: Aeroncas, cracked or whole. Give full details; prices. Sale: Aeromarine Klemm, refinished like new. Snap, $400. Jos. Simcock, 200 E. Roosevelt Blvd., Philadelphia, Pa.

WANTED: NB-8, NB-4 or similar plane. Licensed and in good condition. State price and time on plane. Have cash. Fred Breise, Otisco, Minn.

WANTED: We pay best cash prices for crackups, regardless of condition. State full details in first letter. Becker Aircraft Sales Company, Bettis Airport, Dravosburg, Pennsylvania.

WANTED: New or used Kinner motor; also Edo pontoons, model number 1525 or model number 1835. Gus Graf, Box 392, Canaan, Connecticut.

WILL TRADE AIRPLANES (wrecked or otherwise, with or without motors) worth $150 to $200 on new cars. Will finance cars if necessary. N. H. Chevrolet Co., Wakefield, Nebraska.

WANTED FOR CASH: Airplanes, engine or parts in any condition. Write complete details, price and location in first letter. Joe Poission, Grand Rapids, Michigan.

TRADE: Pitcairn Autogiro, 125 Kinner, for Waco F or similar ship. Rising Sun Aircraft School, 857-67 E. Luzerne St., Philadelphia, Pennsylvania.

WANTED: Fuselage, motor mount, landing gear oleos, and left front wing strut for J-5 six-place Stioson, model SM-1DA. State price, condition and location. Donald Hood, Northampton. Massachusetts.

WANTED: Aeronca C-3 ailerons, propeller, Pyrene. Have 18 x 3, 20 x 4 wheels complete, floats, wings, tail surfaces, instruments, cheap. Thomson Aircraft Development, Cleveland Avenue, Hasbrouck Heights, New Jersey.

HAVE CASH for real bargain Lycoming Stinson. Must have heavy duty crankshaft and be equipped for night flying. Kinoer Eaglerock for sale. Box 247, Hightstown, New Jersey.

WANTED: Sikorsky S-39 right wing, center section, two booms, flippers, stabilizer, motor mount, two outer interplane and engine struts, fuselage parts. Immediate cash. Send full information to Dr. Young, 909 West Broadway, Minneapolis, Minnesota.

HAVE CASH FOR J-5 Waco, Travel Air or Fleet, or similar ship. Give full description and best price first letter. Glenn W. Fellows, P. O. Box 66, Jackson, Michigan.

WE WILL TAKE any licensed airplane in trade on any new Fairchild. Give us a complete description of your ship in first letter and we will send you an estimate of its trade-in value. St. Louis Flying Service, Inc., Fairchild Distributors, Lambert Field, St. Louis, Missouri.

WANTED: Lambert or Warner Monocoupe, or Warner Fleet. Will trade 1934 V-8 coupe as part payment. Stacey Simpson, Little Falls, New York.

WANTED: Root type Supercharger in good condition; preferably one for Cirrus. State cash price. Fred Klose, Lincoln Machine Works, 324 South Ninth, Lincoln, Nebraska.

WANTED: Two Pheasant lower wings. Have nifty house car, factory built, cost $3,500 new; trade for two- or three-place plane. G. S. Barnes, 213 N. Church St., Fayetteville, Arkansas.

WILL TRADE for late model car: Airplane in very good condition; Pitcairn PA-3, open biplane, 3-place, OX-5 motored, new prop and cover, duals. Flyaway here. Or sell for $325. Bargain. Johnsonville Drug Co., Johnsonville, South Carolina.

POSITIONS WANTED

ACCOUNTANT-ENGINEER: Capable of yard-sticking small and large quaotity production without offsetting overhead. Well acquainted with aircraft industry. AERO DIGEST, Box 1903.

LICENSED MECHANIC: Graduate Army Air Corps Technical School; 4 years college; 2 years drafting instructor. Will consider anything offering better future than Army. Go anywhere. AERO DIGEST, Box 1905.

TRANSPORT PILOT: 26, married, 1,460 hours. Flying, maintaining aircraft all types since 1926. University graduate, electrical. Go anywhere; good references, no reasonable offer refused. AERO DIGEST, Box 1907.

TRANSPORT PILOT: 21, 400 hours; barnstorming, student, cross-country work. Land and sea rating. Single. Now employed, desires change; will work hard; salary secondary. Good references. AERO DIGEST, Box 1908.

RECENT COLLEGE GRADUATE with aeronautical and mechanical engineering degrees. Flight training at Curtiss-Wright Aeronautical School. Open for proposition. H. A. Carmody, 1543 58th Street, Brooklyn, New York.

YOUNG MAN, age 22, desires position in commercial aviation. Anxious to learn business. 2 years college, 5 years retail sales experience, 7 hours flying instruction; at present taking evening school air transportation. References. AERO DIGEST, Box 1917.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

PILOT OR YOUNG EXECUTIVE wanted: Young energetic pilot, must be of high character and hard worker. Should have a reasonable amount of executive ability and source of some capital; capable of soon taking over management of a fast growing Seaplane Terminal in New York City. Edwin R. Closs, 74 Rutherford Place, Arlington, New Jersey.

AIR-MINDED MAN with business experience entitling him to high executive position at good salary in commercial air transport company to operate one of choicest routes in Midwest. Must be able to furnish direct, or contact, considerable capital which he will handle. Explain business qualifications as well as financial resources. Details will be mailed to you promptly. Must deal with principal; no agent will be considered. Write AERO DIGEST, Box 1902.

PATENTS: Small ideas may have large commercial possibilities. Write immediately for information on how to proceed and "Record of Invention" form. Delays are dangerous in patent matters. Clarence A. O'Brien, 3146 Adams Building, Washington, D. C.

AVIATION: Airminded young men, mechanically inclined, interested in entering the field of Aviation as apprentices. Write, enclosing stamp: Mechanix Universal Aviation Service, C-13291 Ardmore, Detroit, Michigan.

PATENT OFFICE PRACTICE my specialty; clients' satisfaction, my steady aim; best results, my ambition. Free booklet A, with evidence blank. Sterling Buck, Permanent Bldg., Washington, D. C.

DEAD STORAGE: $5 a month. Ships ferried here, and ferried back when wanted in Spring for expenses. Repairing and refinishing by licensed mechanics. Nelson Flying Service, Bucks County Airport, Hilltown, Pennsylvania.

JOIN AKRON FLYING CLUB: New 3-place plane. I am leaving Ohio and wish to sell my interest in plane. Will include mechanical and cross country technical instruction. George M. Eshelman, Jr., Hartville, Ohio.

PARACHUTES FOR SALE

PARACHUTES: Approved types, bought, sold, exchanged, repaired, packed, rented. Specify full requirements. Airports should investigate drawing power of balloon and inexpensive operation for Sunday business. Thompson Bros. Balloon & Parachute Co., Aurora, Ill. Established 1903.

IRVING SEAT PACK: Like new in every respect. New Army bearskin-lined winter suit, wired; $10. Edward H. Johnson, 64 Grand Street, Springfield, Mass.

PARACHUTES: Two white silk Russell parachutes, in good condition. $85 each. Louis Pulici, 1757 N. Bronson Ave, Hollywood, California. Phone: GRanite 3418.

INDEX TO DISPLAY ADVERTISERS IN THIS ISSUE

Can you answer these questions ?

The compass reading is 230°, the variation is 18°E, the deviation is 7°W. Determine the true heading.
What is meant by compression ratio and how does it affect the power rating of an engine?
What would you do to get a plane out of a tail-spin?
What is the purpose of a condenser in the ignition system? In which circuit is it located?
How is the torque of the propeller balanced in rigging a plane? Why is the vertical fin sometimes slightly offset?
What are 8 significant landmarks that are shown on good avigation maps which may be identified easily from the air?
What is the approximate error in the air speed reading for an increase in elevation of 3,000 ft.?
If your engine started missing on one cylinder, where would you look for the trouble?
What is the effect of having an adjustable stabilizer too high when landing?
How may a pilot correct for drift without a drift indicator?
What are the four basic cloud forms? What is the approximate altitude at which they occur? What flying conditions do they indicate?
In flying out of a small field, is a small or large propeller pitch desirable?

This book will help you to pass any license test:

Aeronautics

A Ground School Textbook

by HILTON F. LUSK

Transport Pilot; formerly Dean, Boeing School of Aeronautics

175 Illustrations, 224 Test Questions, Price $3.25

THERE is nothing specially difficult about the above questions, you should be able to answer any of them without hesitation if you are prepared to pass the written part of the government license examinations. They are selected at random from the 224 test questions contained in Lusk's famous ground school textbook, Aeronautics. These questions are typical of those that have been asked in examinations for the Department of Commerce transport pilot's license, with the addition of others to aid you in testing whether you have really grasped the information contained in the book.

From this book you can obtain just the information you need if you are looking for a government license as a pilot in any of the grades, or as a mechanic. Although it is designed primarily for use in ground schools, as well as in colleges and technical schools giving aeronautic courses, it also ideally meets the needs of the man who must acquire his technical grounding in aviation by home study. The 175 illustrations have the component parts of aircraft and instruments lettered so profusely; the explanations are so complete, thorough and are written in such easily understandable language that anyone can readily grasp every subject dealt with.

Mr. Lusk writes from a background of practical experience. He holds licenses not only as a Transport Pilot but also as a teacher at government-inspected flying schools. Even from the condensed and incomplete outline of the book printed below, you can get an idea of the tremendous range of the subjects he covers.

CONDENSED OUTLINE

Principles of Flight: Explains all the essential aerodynamic factors and their application to airfoils.

Airplane Construction and Operation: Principles of construction and materials employed. Methods for working wood and fabric. Welding metal planes and parts. Flying. Elementary acrobatics.

Propellers: Theory, Construction and maintenance of wood and metal propellers. Variable pitch propellers.

Engine Construction and Operation: Theory. How to determine engine efficiency. Types of engines, construction materials. Fuel systems, carburetors, ignition systems. Engine operation and maintenance.

Blind Flying Instruments: Use of attitude instruments in blind flying. Absolute and relative references. Inclinometers. Pitch, roll, turn indicators. Operating principles of gyroscopic instruments.

Engine Instruments: Construction and operation of tachometers, pressure gages, thermometers, fuel quantity gages, etc.

Safety Appliances: Parachutes. Aircraft radio, antenna details, shielding methods, etc.; radio ranga-beacons and markers.

Avigation Maps and Piloting: Explains and illustrates various map projections and their use in avigation. Practical hints on piloting.

Dead Reckoning: Details of methods of dead reckoning with solutions of practical problems.

Avigation Instruments and Equipment: Describes and illustrates each of the avigation instruments found in aircraft and explains theory so you can understand principles on which it operates.

Principles and Applications of Meteorology: Effects of winds, storms, visibility in relation to flight.

(Fill in, tear out, and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,
Dept. M821, 15 East 26th Street, New York.

Send me the books checked below. Within five days after their receipt I will either return them or send payment in full at the prices shown plus a few cents for delivery charges. (We pay delivery charges when cash accompanies order—same return privilege.)

☐ **Lusk,** Aeronautics $3.25
☐ **Jones,** Practical Flying.....$3.00 ☐ **Hartz-Hall,** Rigging Handhook.$3.50
☐ **Moors,** Engine Manual.....$4.50 ☐ **Eddy,** Aircraft Radio.....$4.50

Name .....

Home Address.....

City..... State*.....

☐ Employed by,
☐ or Reference..... Address.....

(Above line must be filled in unless you send cash)

* If outside continental U. S. and Canada, send cash plus 25c per book for shipping.

CUT THE COST OF YOUR TRAINING

Practical Flying
A Pilot's Training Guide

by Major B. Q. Jones, *Air Corps, U. S. Army; formerly Chief of Aviation Training, A. E. F.* **$3.00.**

Your flight training will cost you less and you will be ready to solo many hours sooner if you follow the practical guidance of this famous manual. Thoroughly covers taxying, the take-off, the initial climb, emergency landings, straight-away flight, glides, turns, figures-of-eight, cross-country flying, stalls and spins, methods of plane inspection, testing controls and motor, etc.

A COMPLETE ENGINE COURSE

Aircraft Engine Mechanics Manual

by C. J. Moors, *Chief Instructor, Department of Mechanics, Air Corps Technical School, U. S. Army.* 189 *illustrations,* **$4.50.**

Gives all needed instructions for servicing or repairing any type of engine and its accessory equipment. For each type the manual describes—and illustrates by detailed working drawings, diagrams, and photographs—exactly how it is built and how it operates; points of difference from other types are carefully pointed out. You are shown how to locate the cause of any trouble and how to correct it.

THE VITAL FACTOR IN SAFE FLIGHT

Airplane Mechanics Rigging Handbook

by R. S. Hartz, *formerly Lieut. Col., Air Corps, U. S. Army;* and E. E. Hall, *formerly Editor, "Aircraft Servicing."* 104 *illustrations.* **$3.50.**

Shows you how to get a plane into proper flying condition and how to keep it that way. Covers in detail sequence of rigging steps, how to true up the assembled ship, how to adjust the wings and control surfaces for "hands off" flying, spars and struts, inspection, installing and checking compasses, fabric, wood and glue, metal parts, wires, dopes, folding and packing parachutes.

A FIELD OF GROWING OPPORTUNITIES

Aircraft Radio

by Lieut. Myron F. Eddy, *U. S. Navy, Retired.* 69 *illustrations.* **$4.50.**

The constantly increasing application of radio in the operation of airplanes makes the information in this book of vital interest to every airman. Complete details are given about apparatus, radio beacons, instrument board visual indicators, etc.; how weather data and flight reports are exchanged between airplanes and ground stations; how radio sets are installed in planes, and how the plane is electrically bonded and shielded to eliminate interference; how to service radio sets; specific circuits; etc.

Your Satisfaction Guaranteed Books Sent on 5 Days' Approval

You can order any of the books described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.

SIXTY CENTURIES OF MANUFACTURING EXPERIENCE

"OLD GUARD"
EMPLOYEE'S ASSOCIATION
THOMPSON PRODUCTS, Inc.
Cleveland-Detroit

Number	Years Continuous Employment	Total Years
447	5 to 9	2809
139	10 to 14	1506
62	15 to 19	973
24	20 to 24	529
9	25 or more	254
681	Total Years	6071

681 EMPLOYEES who have worked continuously in our Detroit and Cleveland factories for five years or more were recently awarded the emblem here pictured. Each pin represents an average of 9½ years' service, or a collective manufacturing experience of over *sixty centuries.* In skill, specialized training and pride in their work these men form the modern counterpart of the old guilds that once expressed the highest ideals of craftsmanship. A similar group is in the background of most precision products that have won world-wide reputation.

THOMPSON PRODUCTS
INCORPORATED

General Offices:
CLEVELAND, OHIO, U.S.A.
Factories: CLEVELAND and DETROIT

Thompson Valves

"SHIPS THAT PASS IN THE NIGHT"

are "ECLIPSE EQUIPPED"

Eclipse Manufactures:

Hand Inertia Starters • Electric Inertia Starters • Direct Cranking Electric Starters • Hand Turning Gears • Retractible Landing Gear Motors • Air Injection Starters • Battery Charging Generators (voltage regulated) • Double Voltage Radio Generators (voltage regulated) • Radio Dynamotors • Engine Driven Radio Dynamotors (voltage regulated) • Engine Driven Alternators (constant speed) • Engine Driven Vacuum Pumps (for Navigating Instruments) • Battery Booster Coils • Automatic Supercharger Regulators • Booster Magnetos • Fuel Flowmeters • Superchargers • Automatic Pitch Propeller Hubs • De-Icer Equipment • Flexible Metallic Tubing.

Detailed data gladly supplied upon request

NEARLY all the air-lines of the world utilize Eclipse-manufactured generator and dynamotor equipment for lighting and radio communication facilities, in addition to starters and other Eclipse devices.

The fundamental qualities of reliability, ruggedness and superiority are essentials of Eclipse products and as such have won universal recognition.

The understandable pride of Eclipse craftsmen in this universal esteem serves greatly to sustain the high standards of quality which have built that esteem.

ECLIPSE AVIATION CORPORATION

{Subsidiary of Bendix Aviation Corporation}

EAST ORANGE, NEW JERSEY

AERO DIGEST

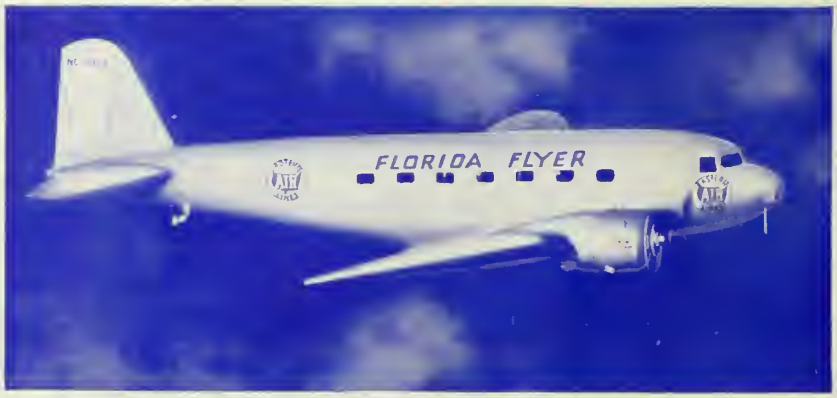
ecember 1934

INCLUDING

AVIATION ENGINEERING

35 CENTS

WRIGHT CYCLONES
Power
EASTERN AIR LINES
Florida Flyer



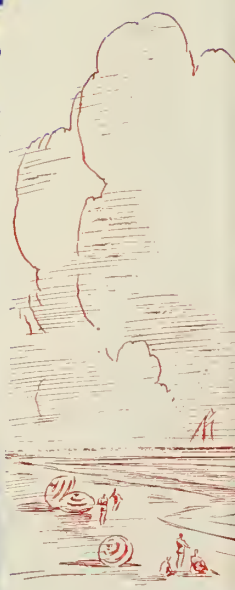
NEW YORK to MIAMI in 8 HOURS! Eastern Air Lines recently inaugurated the following day and night express schedules with 15 Douglas Airliners, powered by Wright Cyclones:

New York to Miami . . . . 8 Hours
Chicago to Miami . . . . . 8½ Hours
New York to New Orleans 8½ Hours

When the last of the Cyclone-powered Douglas Airliners was ferried East for the inauguration of this new Florida service, the plane completed the 2,675-mile flight from Los Angeles to New York in the record-breaking time of 12 hours and 3 minutes—averaging 219 miles per hour.

Eastern Air Lines' "Florida Flyer" has brought the warmth and sunshine of the South to within a few hours of the snow and sub-zero temperatures of the North. This winter the powerful Douglas Airliners will make it possible for business-men to commute from New York and Chicago to Palm Beach and Miami over weekends, in luxurious comfort.

Wright Cyclones power all passenger and air mail transports operated by Eastern Air Lines—another airline powered 100% by Wright Engines.



WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY

AERO DIGEST. *December*, 1934
Volume 25. *Number 6.*

Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

LEAVING NEWARK

ON THE WAY

ARRIVING IN SAN FRANCISCO

UNITED AIR LINES

During the last twelve months United Air Lines have flown 18,000,000 miles with its large fleet of Boeing twin-engine Wasp powered high-speed transports over the company's New York—Chicago—Pacific Coast, and other passenger, mail and express airways.

B. G. Mica Aviation Spark Plugs are standard equipment on the low wing Boeing Wasp powered monoplanes which have proved so successful in the day in and day out service of United Air Lines under all operating conditions. Recently United has taken delivery of new multi-motored Boeings equipped with geared, supercharged Wasp engines which has resulted in improved performance even over that of the previous Boeing 247 type. These new planes, with full load, have a cruising speed in excess of three miles a minute.

B. G. Mica Aviation Spark Plugs are standard equipment of United Air Lines.

B. G. Mica Aviation Radio Shielded Spark Plug model 1B2-S

Patented in the United States and other countries

THE B. G. CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 WEST 52nd STREET, NEW YORK **Cable Address: Golsteco, New York**

"We recommend Standardization on KENDALL OIL for Lubrication"

. . . says the President of the Ryan Aeronautical Company

RONAU[illegible]MPANY
NDBERGH
AN DIEGO, CALI[illegible]
PHONE HILLCREST 0012

August 29, 1934

Mr. I. H. Shearer
Kendall Refining Company
Bradford, Pennsylvania

Dear Mr. Shearer:

You may be interested to know that to every purchaser of our new Ryan S-T Super Sporteter, we are recommending the standardization on Kendall oil for lubrication.

We have the soundest of reasons for doing this. Our own experience over a long period of time has proven, beyond any doubt, the superior quality of the oil. Now, its availability at every airport in the United States, in addition to its delivery in sealed cans, clinches all arguments in its favor.

Our plane is of the high efficiency, completely streamlined type of modern metal construction and is equipped with the famous Menasco in-line type engine which has won such an enviable reputation in the racing world with Kendall oil. In this modern type of private owner plane, advantage is taken of every ounce of extra power so that the best possible oil is just as important as it is in a race.

You have done a real service to aviation by providing a dependable, extraordinarily high quality oil, and aviation is reacting by almost universal approval and use of your products.

Wishing you continued success, I am

Yours very truly,

T. Claude Ryan
T. Claude Ryan
President

TCR:S

READ Mr. T. Claude Ryan's letter. It is the expression of his belief that Kendall Oil offers the last word in dependable lubrication for the modern aircraft of today. And he gives his reasons . . . cogent, convincing reasons that we have heard many times before . . . from aircraft companies, from private flyers, from air race pilots, from transport companies.

Use Kendall Oil in the motor of your plane. Find out what Kendall's quality background . . . 100% Bradford Pennsylvania crude, special Kendall refining processes...really means to you in better lubrication, safer flying, greater oil economy. Kendall is available at all leading airports throughout the country . . . sold, for your protection, in containers sealed at the refinery. Try Kendall, The 30 Hour Oil.

KENDALL REFINING COMPANY
BRADFORD, PA.

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL

The new Ryan S-T Sport Plane, recently introduced by the Ryan Aeronautical Co., Powered by Menasco Pirate Engine, it is representative of the very best in modern planes. Mr. Ryan recommends that every purchaser of the new Ryan S-T lubricate it with Kendall, The 30 Hour Oil.

ADMINISTRATION BUILDING

"EVERY PARKS GRADUATE WAS RE-HIRED IMMEDIATELY UPON REOPENING..."

Again the Aviation Industry places its stamp of approval on Parks Methods and Parks Graduates

A graduate of July, 1934, writes about it from one of the largest aircraft factories in America, where he is employed. There had been a brief shutdown to permit rearrangement of the plant, and also—here is something to ponder over—to permit the elimination of the less efficient men.

When reopening, *EVERY PARKS GRADUATE WHO HAD BEEN EMPLOYED, WAS IMMEDIATELY PLACED UPON THE PAYROLL AGAIN.*

Some men, with years of experience but without Parks training, were dropped. But every Parks graduate, some of them out of school but a few months, had already proven his superior value and was retained.

The business of Parks Air College is twofold:

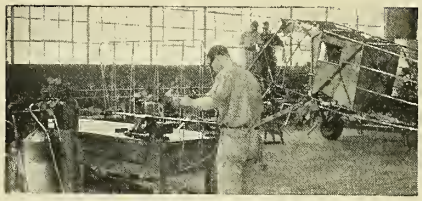
First: Provide the technical and practical training necessary to enable its graduates to make a desirable connection in the aviation industry, and
Second: Provides education broad enough to enable these men to isolate, define, and finally solve the larger problems of the industry so that they will be able to advance to positions of major responsibility.

All its resources are devoted to the attainment of these two purposes.

Its leadership, as a school of aviation, is based upon absolute sincerity in these purposes and upon the high standards of service rendered to students, and, through them, to the aviation industry.

If you want to become an important factor in commercial aviation—this new industry which is growing with amazing rapidity and which abounds in opportunities for capable men—you will want to learn all about Parks Air College. Your request will bring this information to you.

With the aid of Parks training you, too, can equip yourself to be of superior value in aviation.



WELDING DEPARTMENT

INTERESTING FACTS ABOUT PARKS AIR COLLEGE

Founded August 1, 1927. • Owns its own airport of 100 acres. • Has 14 buildings with a total floor area of 119,352 square feet (2¾ acres) all devoted to school purposes. • 3 dormitories and a cafeteria are operated for Parks students. • Has 10 training planes on the line, ranging from the Low Wing Kinner up to the Lockheed Vega. • Offers complete course in radio beam and instrument flying. • Offers three 2-year courses (96 weeks) leading to Bachelor of Science degree in Aviation Administration; Aeronautical Engineering; Aviation Mechanics. • Faculty of 21 composed of specialists in various fields of aviation. • A total personnel of 41 people. • Enrollment of 197 at beginning of Fall term. • 1,202 graduates. • 47,000 hours flight experience. • 1,391 planes and 372 motors repaired and rebuilt in our shops. • Graduates with every leading aeronautical concern in America and in many foreign countries.

You may send the coupon for your copy of the Parks catalog and the Outline of Courses. The mailing of this coupon will be your entry into the aviation industry.

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL AVIATION SCHOOL

Approved by U. S. Dept. of Commerce

SECTION 12 AD, EAST ST. LOUIS, ILL.

"SKYWARD HO!"

Our 44-page catalogue, completely describing Parks Air College and Parks training, will be sent free on request.

*Name*_____ *Age*_____

*Address*_____

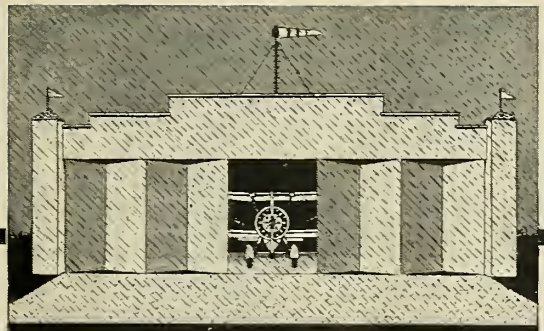
*City*_____ *State*_____

CHECK HERE
for special information on the course that interests you:

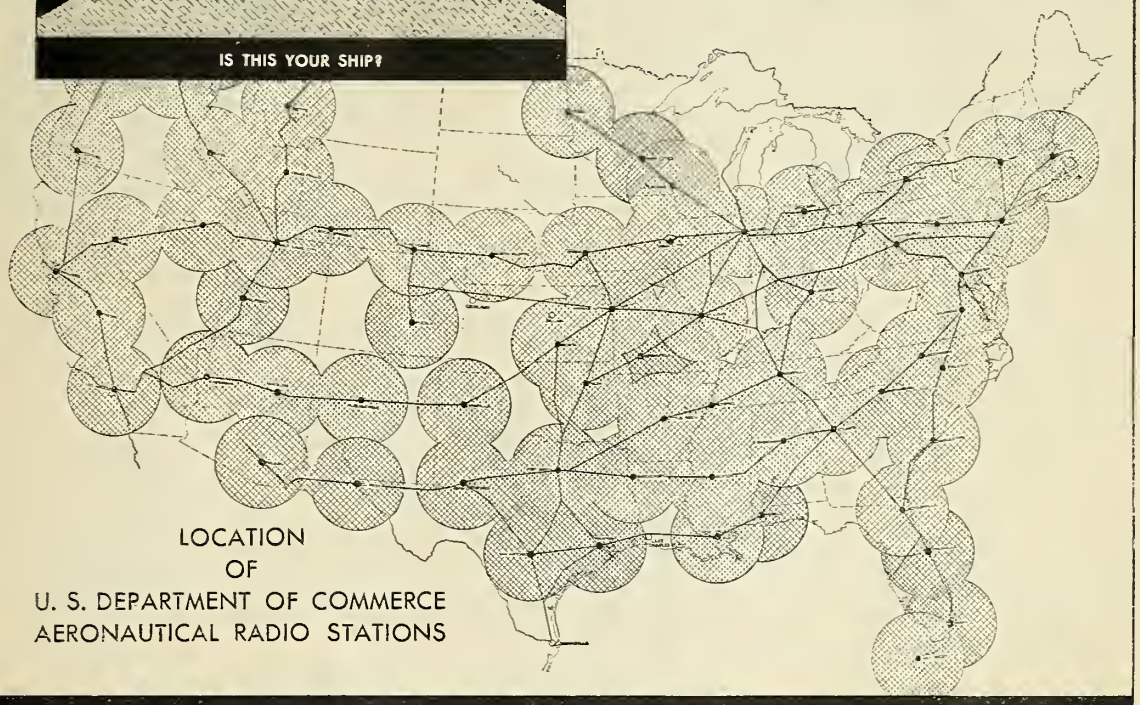
- ☐ Executive Transport Pilots'
- ☐ Master Mechanics' Flight
- ☐ A. & E. Mechanics'
- ☐ Aeronautical Engineering
- ☐ Limited Commercial Pilots'
- ☐ Aviation Business


UNITED STATES COAST GUARD
SEMPER
PARATUS
1790
U.S.COAST GUARD
U.S.COAST GUARD
GRUMMAN AIRCRAFT ENGINEERING CORPORATION
FARMINGDALE LONG ISLAND NEW YORK

RCA VICTOR
RADIOBEACON RECEIVER



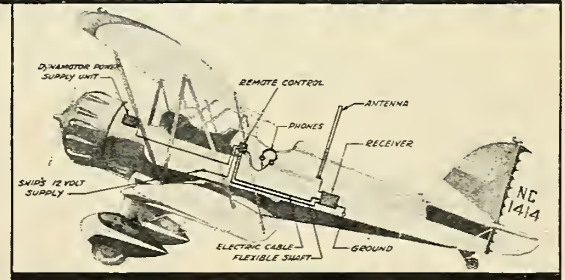
IS THIS YOUR SHIP?



FOR RADIOBEACON FLYING AND AIRWAYS WEATHER REPORTS

AT the first sign of bad weather, does your ship take to the hangar and stay there until the sun shines again? Equip it with an AVR-2 Radiobeacon Receiver. Then you may fly with assurance and without fear of changing weather conditions. The beam will lead you. Weather reports will be continuously available.

This newest Radiobeacon Receiver is designed and manufactured at "Radio Headquarters"—by RCA Victor. It is highly sensitive and highly selective, a SUPERHETERODYNE set created exclusively for aircraft use. It is small, light, and is applicable to any aircraft—for remote or local control installation. Dynamotor power unit supplies all required voltages direct from aircraft 12 or 6 volt storage battery. No dry batteries required.



INSTALLATION WORK ON ANY SHIP IS SIMPLE AND BRIEF

For Information and Demonstration, communicate with:

AIR ASSOCIATES, INC., National Distributors

Roosevelt Field, Garden City, Long Island, N. Y.	5300 West 63rd St., Chicago Municipal Airport, Chicago, Ill.	1200 Airway, Grand Central Air Terminal, Glendale, California

RCA VICTOR

RCA VICTOR COMPANY, INC.
Camden, N. J. *"Radio Headquarters"*

LOVE FIELD **DALLAS AVIATION SCHOOL AND AIR COLLEGE** DALLAS TEXAS

A New Deal Offer

That Means a BIG SAVING to Every Student Pilot Who Enrolls at Dallas

Big days ahead for American aviation under the New Deal! Big opportunities that will come with expansion of this great industry—and D. A. S. takes another big move to help YOU. Write and let us tell you of **another** saving — our New Deal Coupon offers. It's everything this school ever offered before —and an additional saving.

WHY PAY MORE?

Transport Pilots' Course	$1795
Limited Commercial Pilots' Course	$ 595
Private Pilots' Course	$ 545
Amateur Pilot's Course	$ 350
Master Mechanics Course	$ 300

COMBINED COURSES

Limited Commercial and Master Mechanics Course	$795
Private Pilots and Master Mechanics Course	745
Amateur Pilots and Master Mechanics Course	650

Five per cent from the above prices for payment in full at time of enrollment.

Come to Dallas and you will make good.

THE SHIPS WE OWN

- 5 Fleets
- 1 Stearman
- 1 Stinson Cabin
- 1 Waco Cabin
- 1 7-Place Travel Air "Wasp"
- 1 Fledgling
- 1 Swallow Trainer
- 1 Trimotored Ford

A wonderful line-up!

Among Recent Arrivals At D. A. S.

Ask THESE boys what they think of D. A. S.!

Norman Allen, Fultonham, Ohio
Spotswood Allen, Amherst, Va.
Ingolf Berg, 632 East 8th St., Brooklyn, N. Y.
John E. Boyles, 716 Bowen St., Iowa City, Iowa
Donald Brown, Green River, Wyo.
Robert Crouch, 107 Dewey Ave., Groton, N. Y.
A. D. Doerge, Bryan, Texas
A. J. Erckhoff, Raymond, Ill.
Martin Eiseman, Garrettsville, Ohio
Chas. W. Evans, Arden, N. Y.
Jas. B. Fatheree, Mary Esther, Fla.
Herbert Foreman, Bedford, Penna.
Alva M. Francis, Deerfield, Mo.
Robert Gillis, Howe, Indiana
N. S. Hopkins, Claremont, Calif.
George Lambert, Mobile, Alabama
Roger A. Lamouree, Tuxedo, N. Y.
Hudson Landers, Dallas, Texas
Sam LeBase, Strafford, Conn.
Kenneth Lee (May Young Lee), 1454 Lusitania, Honolulu, T. H.
Santos Melito Marte, Republicano San Domingo
Morris Matson, Holmes, Wyo.
Mayo Mickey, Colorado Springs, Colo.
Vern Munger, Alliance, Nebr.
Glendale Price, Liberty Center, Ohio
W. K. Schneider, Sterling, Nebr.
Max Sprenger, 214 Mittlerstrasse, Basel, Switzerland
Gerald Stoneburner, Crooksville, Ohio
W. L. Tyree, Deland, Florida
Vere Underwood, Thrift, Texas
Ed Winn, 1424 Lawton, Columbus, Ind.
Thos. Reese, Muncie, Ind., R. D. No. 5
Arthur Harlow, Portland, Maine

Love Field is a million dollar airport. One of America's best.

We have $200,000 in equipment for you.

Good flying weather all winter — no delays through bad weather.

We own our own dormitories and cafe—we see that our students get the best for the least money.

We are closely affiliated with a company that flies 2200 miles of air mail daily.

Dallas is a live, hustling city of 300,000.

Bus line from Love Field to city. Fare 10c, half hour schedule.

We find part time work for many of our students —full time positions for many of our graduates.

What we say is so. We never misrepresent. Our graduates are our best boosters.

FREE! **The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.**

These special inducements are for you — Now! Write or wire for Catalog and full instruction.

USE THIS COUPON:

DALLAS AVIATION SCHOOL AND AIR COLLEGE
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked and your New Deal offer.

Transport Pilot ☐ Master Pilot ☐
Limited Commercial ☐ Master Mechanic ☐
Private Pilot ☐ Aviation Radio ☐
Complete Radio ☐

Name.....
Address.....
City.....
State.....

DALLAS

AVIATION SCHOOL AND AIR COLLEGE

LOVE FIELD DALLAS, TEXAS

FROM LEFT TO RIGHT: E. H. Huff, Superintendent, Stinson Aircraft Corp.; F. X. Mara, Secretary, S.A.C.O. Association; W. A. Mara, Vice President, Stinson Aircraft Corp.; C. C. Moseley, President, Aircraft Industries, Inc., Los Angeles; B. D. DeWeese, President and B. D. DeWeese, Jr., of Stinson.

Leadership

THE 600th Stinson four passenger cabin monoplane, powered by Lycoming, to be built during the depression years, was delivered to Major C. C. Moseley, President of Aircraft Industries, Inc., Los Angeles Distributor.

RECENT statistics indicate that more 1934 Stinson 'Reliants' were delivered to Buyers in the United States this year than all other four, five or six passenger makes COMBINED.

THIS airplane is a 1935 Stinson 'Reliant' with Speed Arresters (flaps), Smith Controllable Pitch Propeller, and scores of other refinements and improvements which have been incorporated into the design of this model.

THIS record also means that there were more Lycoming Motors and Lycoming-Smith Propellers used during 1934 than all other makes of Motors or Controllable Propellers in this power range.

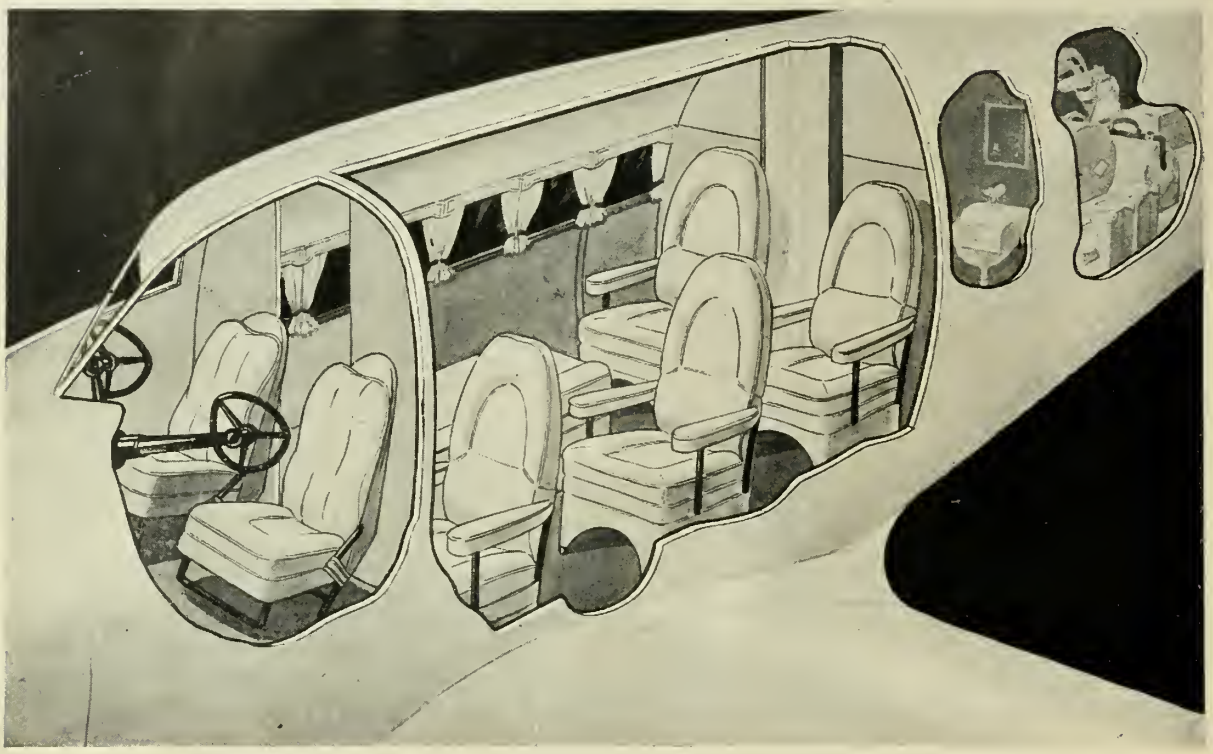
THIS Leadership is maintained year after year only by reason of these Products rendering the best service at the lowest price consistent with finest quality, and we appreciate the confidence placed in these Organizations by all who fly.

THE STINSON AIRCRAFT CORPORATION

Wayne, Michigan, U. S. A.

THE LYCOMING MFG. CO. (Divisions of Cord Corporation) **THE SMITH ENGINEERING CO.**

200 m.p.h. cruising



Airline Performance for the PRIVATE OWNER

The same basic characteristics which have established record-breaking performance, economy and long life for Northrop airplanes in commercial and military service, are part of *every* Northrop product. For such flying sportsmen as Hal Roach, Powel Crosley, Jr., Senator Harding and others, Northrop has combined its all-metal construction . . . its super speed in excess of 220 m.p.h. . . . and its greater payload capacity with transport roominess and comfort for the private owner. The cabin, completely sound-insulated and custom-finished, provides a new luxury in personal transportation that is a fitting attribute to the proven dependability of Northrop performance.

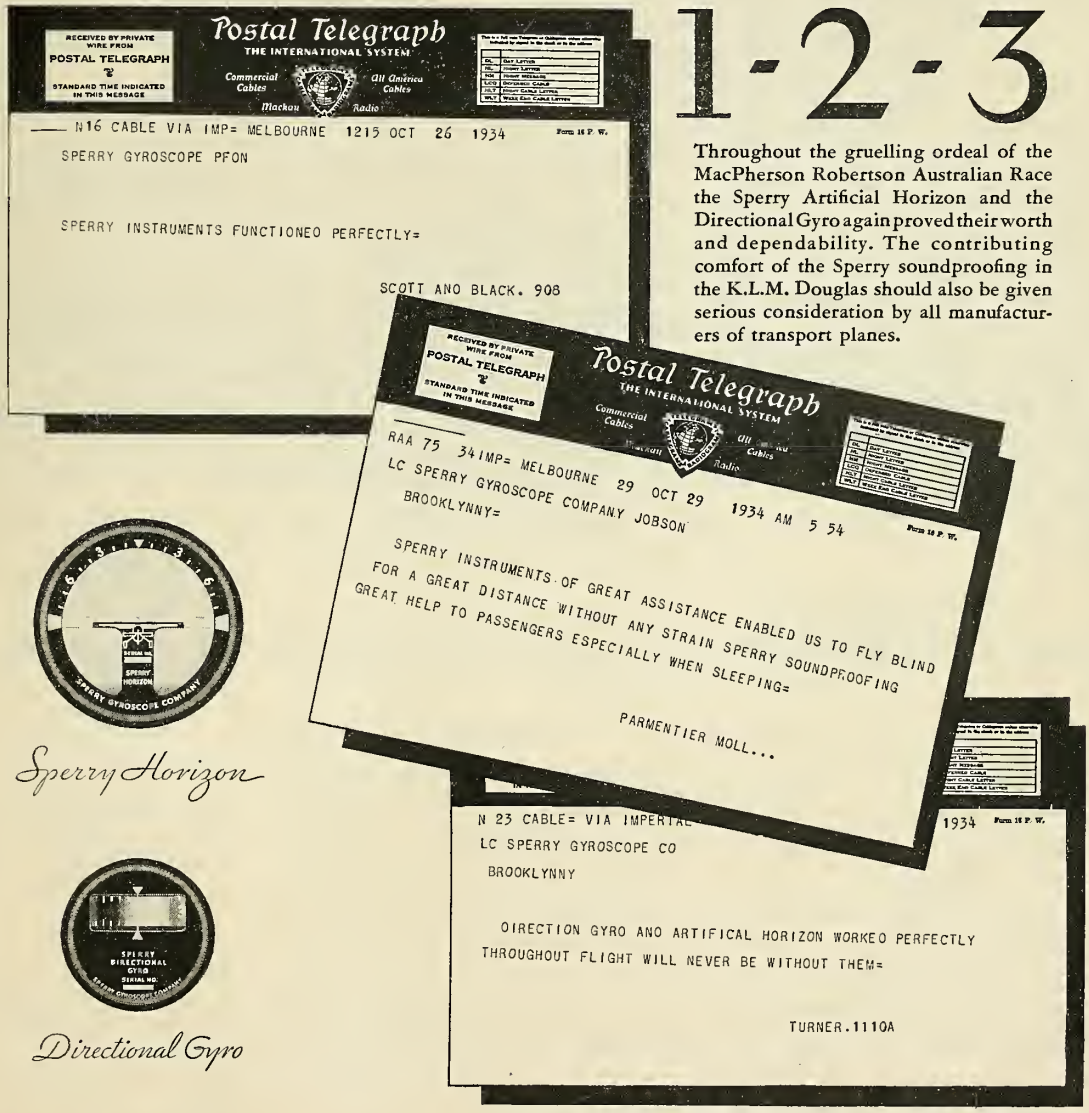
THE NORTHROP CORPORATION, Inglewood, California, U. S. A.

NORTHROP

The Sperry Horizon and Directional Gyro finish

1-2-3

Throughout the gruelling ordeal of the MacPherson Robertson Australian Race the Sperry Artificial Horizon and the Directional Gyro again proved their worth and dependability. The contributing comfort of the Sperry soundproofing in the K.L.M. Douglas should also be given serious consideration by all manufacturers of transport planes.



Sperry Horizon

Directional Gyro

SPERRY GYROSCOPE CO., *Inc.*

BROOKLYN — NEW YORK

To insure the *Safety* of those who fly

85% OF THE AIR LINES CARRYING U. S. AIR MAIL

use MARFAK FOR ROCKER-ARM LUBRICATION

Safety is the most vital factor in aviation. And Texaco has provided MARFAK for one of the most difficult lubrication jobs.

Rocker-Arms are subject to heat and pressure that quickly destroy ordinary grease. MARFAK has demonstrated its ability to lubricate perfectly under all operating conditions. MARFAK will not throw out. It minimizes wear and the number of engine overhauls. Leaders of commercial aviation such as "TWA," "AMERICAN AIRLINES," "NORTHWEST," "EASTERN" have proved that MARFAK is safe and economical.

All Texaco Aviation Products are important contributions to safety — speed — economy. They are available at airports in all our 48 States. Let a Texaco Engineer prove their efficiency and economy to you!

TEXACO

REG. T. M.

SPECIAL MESSAGE *for* DEALERS!

The rapidly increasing demand for Texaco Aviation Products offers you an unparalleled money making opportunity. Write for full details.

The Texas Company
135 E. 42nd St., N. Y. C.

NRA CODE

AERO DIGEST

VOLUME TWENTY-FIVE NUMBER SIX

Contents for December

GENERAL FEATURES

GENERAL DEPARTMENTS

AVIATION ENGINEERING

TECHNICAL FEATURES

TECHNICAL DEPARTMENTS

COVER DESIGN

Fairchild XC-31 Cargo and Troop Transport powered by a Wright Cyclone engine of 750 horsepower

Published monthly by the Aeronautical Digest Publishing Corp., 515 Madison Avenue, New York, N. Y. Phone PLaza 3-6969. Cable address: AERODIG. Single copy, 35c. Subscription price, $3 per year; Canada, $4.25; other countries, $5.

BOSTON: L. Mitchell, 80 Boylston St., Phone Hancock 5066. • CHICAGO: L. F. McClure, 919 No. Michigan Ave., Phone Superior 2802.
DETROIT: W. E. Fellows, 315 Stephenson Bldg., Ph. Madison 9244. • LOS ANGELES: F. E. Samuels, 1129 Mohawk St., Ph. Fitzroy 6332.
BUFFALO: G. W. Campbell, 3156 Main St., Phone Parkside 0479

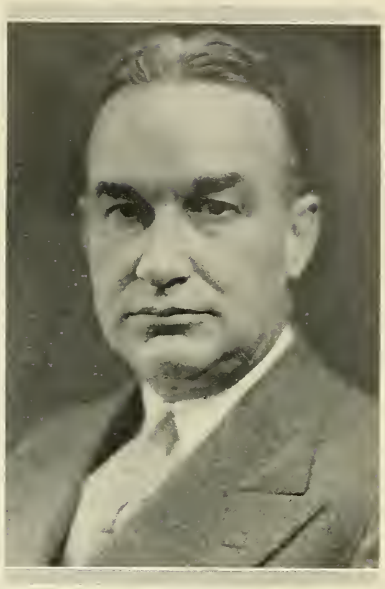
Official photo, U. S. Navy

Six long-range Consolidated flying boats of the U. S. Navy, each powered by two Wright Cyclone engines, in formation flight above Oahu, Hawaii. This is the squadron which flew non-stop from the United States, a distance of 2,408 statute miles

Export Volume and its Relation to Aviation Progress and Security

DONALD L. BROWN

President, United Aircraft Corporation



● Fully as important to American aeronautics as the air mail policy and the military procurement policy, has been the attitude of the military departments of the government toward the export of aircraft and equipment. The great importance of an adequate business volume, if research, experimental production and the opening of new commercial routes are to be continued, has rendered a sound and growing export business absolutely indispensable.

In this field also American industry has been preeminent. Foreign competition has been steadily supplanted in South America, Europe and, until recently, in Asia. American planes and engines are being sold in practically all the countries of the World. Foreign buyers are coming to our shores in increasing numbers. Our success has been based squarely upon the quality and the price of our products.

This export business is partly commercial, partly military. A few years ago most all aircraft, aircraft engines, propellers, instruments, accessories, etc., which were exported were for military purposes. More lately the commercial requirements in the export field have grown to tremendous proportions, and it is hoped that, with a continuance of the former governmental policy, in the future they will far exceed strictly military requirements.

The increase in volume brought to the American manufacturing industry through the export market (military as well as commercial) contributes diverse benefits to this country:

1. This export volume is reflected directly in the reduced costs of aircraft products to our own government, as increased volume means lower cost.

2. It is reflected directly in American payrolls. For instance, the figures of the United States Bureau of Foreign and Domestic Commerce show that the volume of export business done by the American aeronautical industry in 1933 amounted to $9,227,821. This export business provided work and subsistence for thousands of American workmen and their families in many industries throughout the entire country.

3. This export volume also contributes substantially to the maintenance of an established American aeronautical industry readily available to meet the needs of a national emergency.

To what extent, therefore, do considerations of prompting international peace call for a curtailment of that market and the consequent narrowing of the breadth of foundation of our national preparedness? What practical furtherance of international peace would accrue from a policy of governmental prohibition of the export of aircraft and kindred products at the present time? The national and international interests of this country require that these questions be most carefully considered.

The following are too real to be ignored as potential results of a national policy prohibiting exports from this country.

In the absence of joint international embargo rigidly enforced, a policy of prohibition on the part of one nation might well result simply in an increase in the volume of exportation from competitive producing countries at the expense of our own national military foundations and economic welfare.

No prohibition of military aircraft could possibly prevent a country which desires to do so from obtaining samples or specifications and designs of American planes and building its own equipment or having some other country build its equipment from those samples, specifications and designs. Moreover, the State Department now permits technical observers of foreign governments and of foreign arms-producing plants to visit and observe the procedure of American manufacture in American plants.

Shall we by adopting a policy of export prohibition invite others to steal the technical excellence of our American product, and dump the benefits of American initiative and governmental cooperative aid into the laps of other countries and their producers?

Under our present patent laws, the price which an American inventor must pay for protection of the results of his ingenuity is a public disclosure to the world (through publication of the Patent Office) of the details of his invention. Every military secret, therefore, ceases to be a secret from the moment its inventor seeks legal protection. Under our patent laws our Government promptly publishes his invention and disseminates its details to any nation or to any arms manufacturer in the world who may be interested.

For this additional reason, prohibition of the export of such military devices, even by joint international action, could not prevent the exploitation of American patents by foreign governments determined themselves to produce armaments, or to have their nationals or the nationals of other countries produce armaments for them.

The possibility exists of embarrassment to this government through its prohibition of export to a friendly nation which desires aircraft. Reprisals might well be provoked to the injury of this country's trade and foreign relations.

Moreover, might not joint international embargo stimulate countries which are not now equipped for armament production, to create and build up their own armament producing industries? And when built, they would naturally seek volume. Is it not possible that even joint action on the part of the great armament producing powers to the end of restraining export to weaker countries might, as a practical matter, initiate a new type of race in armament production facilities and even in armaments?

Most commercial aircraft engines, propellers, instruments, etc., are convertible to military uses with greater or less facility, depending upon the technical ability and industrial and financial resources of the country making the conversion and on the type of military operations to be undertaken by it. This, however, is equally true of almost any commercial product. Logically, if export of all aircraft were prohibited, virtually our entire export trade should be prohibited.

An isolated policy of prohibition would hardly achieve the withholding of aeronautical equipment from a nation deter-

(*Continued on page 70*)

Do the Air Races Help the Industry?

●

CY CALDWELL

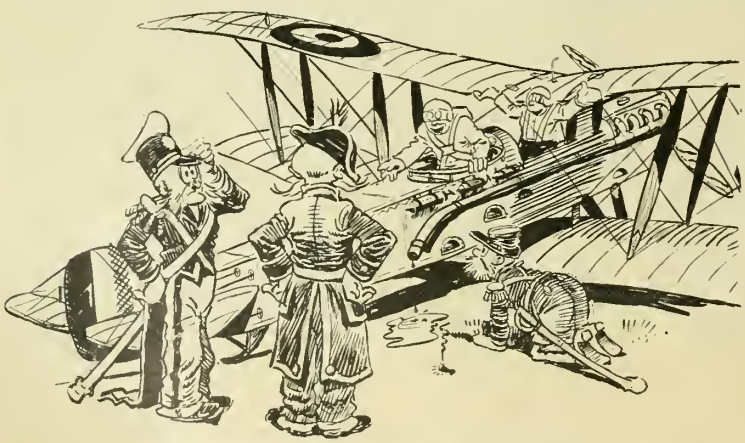
● While we've never been especially secretive about the fact that the United States of America builds the world's fastest transport planes, it has taken a Scotchman living in Australia to prove it to the world in a spectacular, exciting and convincing manner. Of course I'm referring to Sir MacPherson Robertson and the 11,323-mile race from Mildenhall to Melbourne, which proved that while the English delight in building airliners that resemble the old family woodpile, they also can build the world's proved fastest long-distance racing plane to date —the D H *Comet*.

The MacRobertson Race provides plenty of glory and commercial advertisement for both England and the United States as airplane and engine builders, and both countries should be delighted with the results. It would have been even better for us if we had managed to produce a racer that beat the English; and it would have been better for the English if their other two D H *Comets* had captured second and third places in the speed race. But they can feel very happy that two out of three of these hurriedly designed and built racers, with so short a time to work the bugs out, made such a splendid showing; and we can feel delighted that two large standard American airliners, identical with others that shuttle back and forth across the continent every day, came in second and third behind a racing plane, and landed at Melbourne while the remaining contestants were yet strung out all the way from Greece to Australia, with one of them in jail.

The important fact about such a contest is that after the plaudits of the throng have died down, after the pilots have received their just rewards of cash and praise, the aviation industries of their respective countries quietly dig in and try to earn some money. After all, it is a matter of only sporting importance, and very soon forgotten, that gentlemen named Scott and Black and Parmentier and Moll and Turner and Pangborn flew rapidly from England to Australia. Many other brave gentlemen have flown fairly rapidly from England to Australia—and to save my life I can't recall the names of half of them. I'm not belittling the sporting effort of these pilots, naturally, but it is a proven fact that personal fame is a fleeting commodity. What there is of lasting value, what of tangible return from these exploits, lies in what we may call the commercial residue.

Two years from now mention Scott, and someone will say, "I haven't read his novels for years!" But ask the de Havilland Company how many airplanes and engines they have sold as a result of Scott and Black's flight and they'll tell you to mind your own business, likely enough. But the number of airplanes and engines, not only de Havillands but other English airplanes and engines that will be sold, will be enough to make the English aviation industry feel rather pleased with itself.

For a big win like that has far-reaching results; it tends to put the hall-mark of quality on *all* English aircraft products, and don't doubt it for a minute. Probably the English aircraft trade itself has no idea how much business has come its way as the indirect or perhaps the direct result of winning the Schneider Trophy for speed in 1931. But by dint of hammering into the consciousness of the world that England held the word's speed record—and there are no beter propagandists than the solid, stolid old Britons—English aircraft that could barely crawl were foisted on a credulous world. Many a military foreigner, seated in a stodgy British military aircraft with control wires on the outside of the fuselage and struts and braces glued all over it, can thank Mr. C. G. Grey and his propaganda mill that he isn't going fast enough to keep the spiders from spinning cobwebs across his eyes. Because Mr. Grey, taking full advantage of the publicity value of the Schneider Trophy, hypnotized the foreign buyer into believing that ALL English airplanes were so fast that you had to pour water on them while in flight to keep them from burning up with friction. Mr. Grey is the Houdini of the British aircraft trade—he puts his hand in a hat and pulls out a mass of claims that go scampering off in all directions, like a stage magician's rabbits. He really got them all out of that one *chapeau* of Mons. Jacques Schneider. English military airplanes are actually slower than ours—and most of ours yet in service are far too slow for this modern day. But give Mr. Grey just one fast trip by one fast Englishman in one fast English aeroplane, and in practically no time he'll have the world believing that English aeroplanes are so speedy that while in flight they are invisible to the naked eye.



Many a foreign air force fell for British sales talk

But advancing age and the Temple Press have begun to mellow Mr. Grey. Writing in the *Aeroplane* about the MacRobertson Race he has been more than kind to American contestants, and very enthusiastic about our two transport entries, especially the Douglas, of which he has always been an admirer. Admirably fair, except when he is on a propaganda rampage, he gives the Douglas its place as the world's finest air transport, and says that the English should set to work and build an even better one. There is no reason why they shouldn't try, for aviation doesn't stand still; by that time Donald Douglas will have an even better Douglas, and Boeing will have a still better Boeing. Instead of building tomorrow's airplanes to-day, they'll build them day before yesterday. So it goes: nothing in aviation stands still, except possibly myself.

But getting back to our American side of the MacRobertson Race, let me mention again, as politely as possible, that at this time the United States really does build the very best, the very fastest, the most reliable, and the most economical-to-operate transport airplanes that you will find anywhere in the world. In fact,

without any nationalistic boasting whatever, I hereby invite the world to send us pictures, drawings, and descriptions of transport aircraft that are the equal of any of the following airplanes in the single and twin-engined classes: the Douglas, Boeing, Lockheed, Vultee, and the Northrop, and we will give them publicity. Of these airplanes I have personal knowledge through having flown in them, and of having flown two of them. They are the world's fastest air transports at this writing, and I believe that it is going to take the world some little time to catch up. I don't say that the world can't catch up, for such a claim would be absurd: what one man can accomplish another man of intelligence can equal or surpass. But right at this minute the United States is far ahead in the design and fabrication of fast transports; and it is my belief that for some time to come the States will hold that lead.

In the matter of light aeroplanes the English are ahead of us, as the grand flight of Sq. Ldr. Malcolm MacGregor and Mr. H. C. Walker in a standard Miles Hark with Gipsy Major engine proved beyond any reasonable doubt. They are two fairly big men, yet in an open-cockpit plane with only a 130 h.p. engine they flew about 2,000 miles a day for five days from Mildenhall to Melbourne and knocked 30% off the record for light aeroplanes from England to Australia. However, a good big man can usually beat a good little man; and speaking for myself I wouldn't trade a Waco or a Beechcraft for all the little airplanes on the globe. The high cost of gasoline is really what has advanced the light aeroplane in England and other countries. An Englishman recently crashed his little aeroplane—he sat down suddenly and forgot that he'd put it in his hip pocket.

It seems to me that one important lesson we learn from the MacRobertson race is that, for all our supposed Yankee skill in the matter of ballyhoo, publicity, and advertising, a generous and sporting Scotchman has given our airplanes a more effective advertisement than we have heretofore managed to give them ourselves. Haven't we fallen down on our jobs? Why is it, in this large and sometimes prosperous country, that we haven't been bright enough to dig up a MacRobertson of our own? Or a Jacques Schneider? Or a Deutsch de la Meurthe? True, we have Vincent Bendix and the worthwhile Bendix Trophy; we have my friend Ed Thompson who gives the Thompson Trophy in memory of his father, Charles E. Thompson. And that is about all, except for prizes of lesser amounts donated at various air races. But we have nothing really big, nothing to compare in international publicity importance with the MacRobertson or the Schneider, now finished, or the Deutsch Cup. Can't some of us corral and rope a sporting millionaire of our own? How about Mr. Ford?—Have we let him get away from us? Henry isn't very sporting, but Edsel is. And the duPont Dynasty—how about them? Henry, why don't you and Felix talk it over with the patriarchs and see what could be done? Are we going to let the foreigners put up all the big prize money in aviation, or are some of the home folks going to plough back part of their American profits in a new and coming American industry—just for the sport of the thing? Don't we raise any more rich American sports like the late Gordon Bennett who is remembered and respected, not for the money he made out of his newpapers, but for the cups and cash prizes he presented in balloon, airplane, and automobile racing? Surely *all* of our rich men can't be mere coupon-clippers—there must be a few good sports among them. It's up to some of us to promote these old boys and get them—and their money—with us. They'll get their money's worth, too, if they put up a really good prize for a worthy object. Who ever heard of Sir MacPherson Robertson until he aerated himself? Now, instead of being known only to Australia as a fellow who made chocolate drops, he's an international celebrity, held in affection and respect by millions of people.

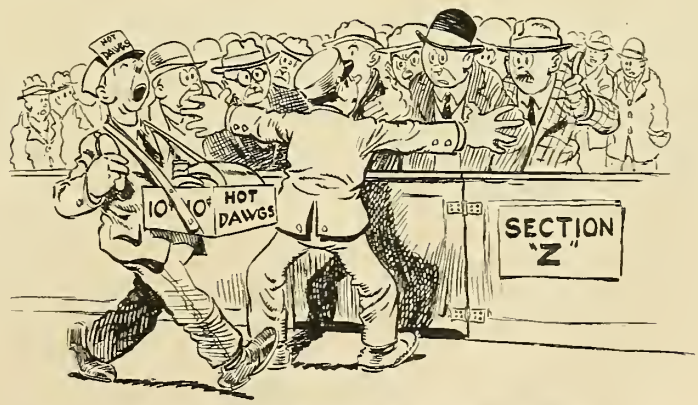
Just as a suggestion, how about a prize that would make it worth while to hold a Tri-nation race next year, up to Canada, down our Pacific coast to Mexico and Mexico City, and back up along the Gulf of Mexico and through Florida and the Atlantic States? Or Rex Martin's suggestion of a race to and around South America? And make the race mean something for commercial aviation and the development of transport and private sport planes. Right now we have no single prize that in any way aids the advancement of commercial aviation, except the Bendix and possibly the Thompson; and neither one of those wins nor merits international publicity.

And how about the National Air Races? Well, they're just a pleasant and amusing flop so far as helping American aviation is concerned. If you read my report about them in the October issue of AERO DIGEST you may recall that I wrote them up as nothing more than an Air Circus. They are not primarily races, even in the most liberal interpretation of the word: they are mostly an aggregation of parachute jumpers and stunt pilots, with show formations by the Army, the Navy, and the Marine Corps. So far as selling American airplanes to anyone, even to our own citizens who attend them, the National Air Races are a complete and unquestioned wash-out.

What American commercial airplanes did anyone see except in a brief fly-by stunt of a few planes? What did the American public learn of speeds of commercial airplanes that anyone could buy and fly? The fact that racing experts like Roy Minor, Lee Miles, Art Chester, and Roger Don Rae are able to fly at 200 miles an hour with an engine tied to an ironing board is merely interesting to Mr. and Mrs. John Smith, U. S. A.—it doesn't help them decide to buy an American commercial plane. And what are we supposed to be promoting, if not commercial aviation, at the National Air "Races." And when it comes to that, how can you call it a race when the fastest machine gets out in front, the next fastest takes its place next, and the others string out in a line that you know certainly never will be broken in that particular trek around a course? This year there were only 15 airplanes flown by 16 pilots; they repeated over and over again in the various events. Each time before each race you knew who would be first, second, third, fourth; it was about as exciting as watching a parade of circus elephants, with each one holding the tail of the one immediately ahead of him.

I admit part responsibility for this dull and stupid condition: two years ago I advocated a plan to exclude A.T.C. planes in an endeavor to build up a racing cir-

(*Continued on page 70*)



Oh for the many privileges of the hot dog vender!

AIR

Hot and Otherwise

FRANK A. TICHENOR

● Where is the man who upset the apple-cart? For nearly six months now, the Federal Aviation Commission has ostensibly been busy picking up the apples which were strewn all over the road by the air mail cancellations last February. For three months, the Commission has been holding public hearings at which representatives of the Government and the industry have been presenting their apples for examination as they helped reload the cart. But where, during all this time, has the man been who spilled the fruit in the first place? Where is the man who shouted, "Whoops, the apples are rotten! Heave 'em overboard"? Where is Jobmaster General Farley?

The Commission's open hearings are just about over, yet to date (November 26) Farley has not been called to the witness stand. Why not?

Don't forget—it was Farley who said the American air mail system was rotten and corrupt. It was Farley who said that the air mail contracts were annulled only "after careful and deliberate study of the entire situation." It was Farley who contended that the old contracts were "illegal" and that he had reams and reams of data to support that contention.

Well, where are those reams and reams of data now? It is the job of the Federal Aviation Commission to find out what, if anything, was wrong with the old air mail contracts. Without ascertaining that first, the Commisison cannot logically determine upon a "better" air mail policy to recommend to Congress. Then why hasn't the Commission called upon Farley to supply that first premise?

Farley claimed he based his summary action upon "the records, books, papers, contracts and documents in the (Post Office) Department." He has never revealed what those "records, books, papers, etc.," contained except in glittering generalities and broad, sweeping accusations. It is the Commission's bounden duty to ask Farley to produce every last detail of evidence and give a satisfactory explanation of just how he interpreted it to support his un-American *modus operandi* of conviction before trial. If he cannot *prove* that his action was justified, the Commission should demand that he explain just exactly what he really had up his political sleeve when he cancelled the mail contracts. Unless the Commission does this, American aviation—yes, even all of American business—will never know how it stands when dealing with Federal officials who publicly boast that they have the power to throw government contracts out the window whenever political expediency moves them to do so.

Is the Commission going to whitewash the administration's political crown prince by conveniently forgetting him? Considering its fine handling of other phases of its assignment, we cannot believe that it is. Yet thus far Farley has played the hit-and-run driver of aviation, and gotten away with it. He collided with aviation last winter and left the wreckage scattered over the highway. The least he can do now is help clean up the mess, let alone give his version of the accident. If Farley's head-on collision with the airline operators was unavoidable, the Commission should know why so that it can devise traffic rules to prevent such disasters in the future. If it was deliberate, then not only the Commission, but the people of the entire nation, should know the reason the Jobmaster General steered headlong into one of America's most vital industries.

* * *

If the Federal Aviation Commission fails to call Farley before the bar, its duty will not have been performed. No matter how well-conceived or how constructive its final recommendations, one omission or oversight of this kind will return to haunt it. Such seems always the fate of those who are chosen to make a thorough, impartial study and reach an unprejudiced decision on any great national question, and who fail to do so. Such is even now the miserable fate ot the Baker Board.

In some respects, the Baker Board turned in a fine report with excellent suggestions for building up the material equipment of the Air Corps. But it committed the unpardonable sin—unpardonable, because those who sin knowingly are never pardonable—of trying to appease the gods of the military Olympus. And it was the will of those gods that for every pound of materiel a pound of morale be extracted. Today one of the ablest officers of the Air Corps lies in Arlington Cemetery to haunt the members of this Board for that sin.

Colonel Horace Hickham, commanding officer of Fort Crockett, Texas, died in his plane because the anti-air gods of the Army decreed that high-ranking Air Corps officers must be put in their place. They had made the terrible mistake of being too active in support of a separate air arm; they knew too much about the way in which the brass hats were hampering the Air Corps's effectiveness by meddling with and confusing its organization. So their spirit must be broken.

The device which they conceived to administer this dose of poison was neat and apparently innocuous. The Baker Board "innocently" suggested that hereafter and henceforth all Air Corps officers with more than fifteen years' service must have their piloting abilty passed upon by a specially appointed board. If they cannot satisfy these "inspectors," they must suffer the consequences by being dropped from the service or shunted off to a non-flying branch of the Army.

But what does this policy really mean? It means that the men with administrative experience in the Air Corps, the men of executive ability gained through long years of activity in military aviation, are being raked out of the Air Corps under the thin excuse that they cannot do the hard and varied types of flying that are essentially the work of younger pilots. This, despite the fact that everyone with common horse sense knows that any organization, be it military or civilian, needs two elements—one to direct, the other to carry out those directions.

Colonel Hickham died practicing night landings in order to satisfy the demands of this ill-conceived policy.

Fortunately, these mean tactics are not going unnoticed by the taxpayers who pay for the training and experience of such men as Colonel Hickham. Newspaper editorials and radio commentators are rising in wrath to tell them how their money is being misused. Particularly Boake Carter, over a CBS hook-up recently, rose to heights of indignation which carried the message of this mess to the people with a force and power which cannot fail to sink home. He summed up the whole sorry business when he said:—These older Air Corps officers "have spoken too frankly in support of air defense. So they are being ordered to do a young man's type of flying. The authorities well know that most of them will not get by. A neat, if shoddy, un-American way of gaining the ends sought.

"The (Air Corps's) directive heads are on the spot. Fly and fly hard or get out is the dictum. (The General Staff) betrays the fact that it thinks only in terms of chauffeurs and chauffeuring when thinking of air. It thinks nothing of organization. And so the elder men are risking their necks every day at various fields throughout the nation. Some may die. Some may be forced out. The Corps is losing its directing geniuses. The nation loses some of its best air officers. But a policy is appeased."

EDITORIALS

"If it had not been for Henry Ford's early interest, the interest of the Aluminum Company of America, General Motors, Boeing, Percy Rockefeller, Stone and Webster, Whitney and men of this calibre, it would have been years before the Government in its experimental stations could have brought about the advancement in military aircraft, types of structure, methods of design, and the things which have gone to make American aviation lead the world."—Reed Chambers, Vice-President, U. S. Aviation Underwriters, Inc.

The Year 1934 In Retrospect

● As 1934 passes on, we reflect on the events that took place in our industry. No wild huzzahs can be shouted for some of the things that happened, but there are other events that long will be associated with aviation in 1934.

Among the latter, is the development of the Sikorsky S-42 and the Douglas DC-2, both extraordinary products of the ingenious American engineer and both record-holders of various marks in their particular fields. The entire world has saluted their performance and hailed their development, and it is particularly gratifying that the United States should have been the locus for their introduction.

Also 1934 will go down in history as the year in which American aeronautical exports reached new heights and in which we cemented our position as the leader of aircraft and engine sales to all corners of the globe. The noteworthy stamina and performance of our products have slowly but surely gained for us this coveted position in the field of world-wide commerce.

Aircraft and engine production have given encouraging signs of rising from the depths into which it had fallen and while no new highs were reached, the slow climb is indicative of better times in 1935.

This is the year that will be outstanding as the one in which the government did everything in its power to bring disaster to the industry. First we had the farcical cancellation of the mail contracts and the subsequent explainable failure of the Army Air Corps to fulfill its mission as a mail carrier; then came the obnoxious McKellar-Black air mail law which threatens to rob the transport operator of his initiative by the unscrupulousness of its terms and demands; then came the Nye munitions investigation and its resultant unfavorable publicity which even now is finding repercussion in loss of export business and finally came the assumption of control of the Army Air Corps by the General Staff. (God help it!)

On the other hand, however, the government has caused the construction of some 2,000 new airports and by its loans has made improvements possible on established fields that were sorely in need of them; it has promised to build up the army and navy air forces and has given the industry an opportunity of being heard before a Federal Aviation Commission which will endeavor to straighten out the mess caused by the malicious meddling of petty politicians unfamiliar with the workings of the industry. All at the expense of the taxpayers. (God help them!!)

English Speed First-Class Mail

● Here in the United States we like to consider our people the most aggressive, energetic and progressive in the world. We pride ourselves as being enterprising, shrewd and most businesslike, taking advantage of every opportunity and making the most of our chances. There are times, however, when reports of activity abroad cause one to wonder if our people really are progressive after all.

For instance, we think the English are plodders who get where they are headed, usually to find us there long before. This might be true in some cases, but it certainly is not true in some phases of aviation.

History is repeating itself. The Wright brothers had to go to France and England to carry on their development work after their ship had flown at Kitty Hawk. Finding little encouragement from an apathetic public in their native land, they achieved recognition and acclaim for their efforts abroad.

Under a new internal air mail policy, the British Post Office, recognizing the value of aircraft in modern business, now sends all first-class mail by air, without extra charge. It has reduced the rates for postage on the empire routes and is encouraging transport companies to offer their services on several new routes. This despite the fact that the gain in speed is slight as compared to its possibilities in the United States.

While we were talking of all first-class mail by air in subdued and hushed tones, England has once again stolen our thunder and has actually instituted this service without fanfare, bereft of political influence and imbued with the desire to do everything in her power to help British aviation.

If this is evidence of typical American business progressiveness in availing ourselves of aviation's possibilities, then the air mail's Patron Saint is Jim Farley!

Another Achievement

● The Pacific coast and the Atlantic seaboard have twice this year been brought closer. First, Roscoe Turner flew a special racing machine across the continent in 10 hours 2 minutes, the fastest ever between the two oceans. Then Col. Eddie Rickenbacker brought a Douglas transport from Los Angeles to New York in 12 hours 3 minutes to establish a new transport plane record for the distance.

It is significant that a standard passenger plane, carrying two pilots and four passengers, should come so close to the mark held by a special racing plane with a special engine. Given a better break in the weather, it is entirely conceivable that the Douglas could have equalled or bettered the all-time mark, carrying to even greater heights the acclaim it received for its splendid showing in the MacRobertson Race. One of our English contemporaries said most of the world has gone "Douglas crazy," and having seen the plane in flight and talked with the completely-rested men as they stepped from their plane at the end of the long transcontinental trip, one must be impressed by the fine advancement in American aeronautical engineering and ingenuity.

Let Us Honor the Wrights

● Aviation has made phenomenal progress since 1903 and continues to make forward strides year by year. December 17, the thirty-first anniversary of the first airplane flight is an appropriate time to inaugurate plans for an annual "Aviation Day."

A fitting means of immortalizing the brothers Wright would be found in an annual celebration during which the entire nation would be familiarized with the progress made since man first flew in a power-driven heavier-than-air plane.

This day would not only honor the Wrights, but also serve to bring these advancements to the attention of potential aircraft users, either as owners or air travelers.

We fortunately have an opportunity to pay public tribute to the genius of Orville Wright as the living symbol of the Wright family's illustrious contribution to mankind.

Personalities

By Caldwell

● THREE FAMOUS organizations are noted for always getting their man—the Northwest Mounted Police, the Marine Corps, and Mae West. So far I've had actual demonstrations by the Mounties and the Marines. Some 12 years ago I flew a Mounted policeman, minus his horse, up to a place called Berens River, in Manitoba, where he got his man, an Indian who had done a bit of plain and fancy carving on another Indian. He was only a small Indian, and he came along very quietly, looking rather fed-up, but anyhow, he was a man and the Mounties got him, just as they do in the fillums.

And then the Marine Corps, which never fails to get their man unless he happens to be named Sandino, gave me a demonstration only last summer, through the courtesy of 1st Lieut. Walter Amory, Executive Officer of Observation Squadron 6 of the Marine Corps Reserve, who took me up with him in a Curtiss Hell-Diver from Floyd Bennett Field. We went up to shoot a few holes in a large towed target, and made several practice dives at the thing, while I sat in the gunner's seat enjoying myself immensely. I've never done anything like that myself, so I got a great kick out of feeling us whip around and dive down toward the water, pull out, and zoom up at the target, and just miss it by a few feet as the towing plane dragged it past, and we soared on up and away, with a hey-nonny-nonny and a hot-cha-cha. Well, we did this several times, apparently getting more and more confidence with each passing moment, until finally we flew right through the target, wrapped it around the center section, hung shreds of it on a gun fixture, and draped the rest of it around the rudder and fin.

Of course, I know that these Marines are wild fellows, but something told me we weren't supposed to do that. Besides, I was wondering if the section of cloth target wedged in between our rudder balance and fin was much of a benefit to the flying qualities of our Hell-Diver. I touched Amory on the shoulder and pointed out to him the slight change he had made in the Curtiss company's original design, while I unbuckled my seat belt and got ready to transfer to the Irvin, in which I suddenly felt a great interest and affection. The bold Marine, however, merely shrugged his shoulders, moved his rudder back and forth to prove he still had control of the situation, and flew on his way rejoicing —like Smedley Butler when he manages to get his name in the papers.

All of which goes to prove that Walter Amory is quite a marksman and that I'd better keep out of Marine cockpits if I don't want to be half scared to death, which is a strain on an old man of my years. This Demon Destroyer of towed targets was born in Walpole, N. H., in 1899, educated at Riverdale School and

Lt. Amory, U.S.M.C.

Groton, but learned so little that in 1917 he enlisted as a cadet in the Royal Flying Corps, Toronto. After training in Canada he was commissioned 2nd Lieut. and posted to 79 Squadron, Texas, for duty. There he was discovered stunting a JN 4, which was positive proof that he was ready for overseas. Anyhow, the C.O. thought it well to get rid of him before he used up a Jennie, just playing, so the summer of 1918 found him at Shoreham, England, for S.E.5 instruction, which he took aboard, then was posted to Pilots' Pool, and hence to 32 Squadron, Arras. He was now actually in the war, and nothing could be done about it. After he swung into the routine of two offensive patrols daily, with an occasional dash of bombing escort duty, he began to wonder, like many another youngster of 18, how he'd ever come to get himself into an exposed position like that, with low-browed Archie wallahs hurling shells at him from the ground almost continually, and other young gentlemen in Fokker D 7's shooting at him every now and then just to break the monotony.

One day coming back from offensive patrol an Archie burst near by, and by an odd coincidence the water temperature gauge rose until the pointer hit the pin, which is not one of the approved positions. Conserving the Hisso's flagging energies, Lt. Amory throttled back, losing altitude and his formation with distressing rapidity. He recalls the lads in grey looking up and pointing things at him, such as Spandaus and Mausers, as he coasted over the lines; then he passed over the boys in khaki, who waved encouragingly as they listened to his knocking Hispano; but he kept on going, past trucks moving up to the lines with ammunition and supplies, and finally sat down on an emergency field, with a gash in the radiator and no water left, except the beads of perspiration that were mantling his brow.

On a later occasion his squadron was escorting a DH 9 bombing formation over Mons, a charming Belgian town where the British Army had paid a brief visit in 1914, but had left because of the low social state of the place when a lot of German tourists moved in, carrying their lunches, which consisted largely of bottled beer and blutwurst sausage and hand grenades, all of which are rather obnoxious to a cultured Briton. Well, these German tourists were still below, and the DH 9's were dropping flowers and so forth on them, with the S E squadron sailing along somewhat higher, and at about 15,000 feet above the happy tourists, who of course were shooting up Archie with gay abandon. And all the while a nice 15-plane squadron of Fokker D 7's was sneaking in on the bombers, just in a spirit of good clean fun such as you encounter in these wars.

"My flight was above the Fokkers," writes Amory, "when Socko! the Captain dives. The Captain picks the leader of No. 1 flight and I line up No. 2 in my sights and hold him there until I thought my prop would cut off his fin. Then I let the poor fellow have it and pulled up and around to see him spinning down dizzily. I could zoom up to about the level of their top flight, which wasn't

(Continued on following page)

AIRWHEELS*?

Sure! More and more of the new transport planes are using this safety equipment

The new high-speed Vultee, built by the Airplane Development Corporation, has Airwheel Tires and Tailwheels, as well as Airwheel Hydraulic disc brakes

POINT number 1 in "the outstanding features of this new plane"—according to the technical description, is this:

"Its exceptional high top speed and cruising speed and its low landing speed *and ability to land on small fields.*"

And that's where Airwheel equipment comes in. With retractable gears, the size of the wheel or tire makes no difference in flight—but when it comes to *quick landings* — under *all kinds of landing conditions*—there's nothing to match the big, soft Airwheel* or the reserve power, the smoothness, the sure action, sure release of Airwheel disc brakes with non-energizing hydraulic control.

You'll find this safe-landing, quick-stopping equipment on more and more of the modern ships.

When may we tell you all the advantages? For full information write to Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

GOODYEAR

* IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL!

AIRWHEEL is Goodyear's trade-mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of AIRWHEEL Tires

When you buy a new ship specify the Goodyear Airwheel and the new Goodyear Hydraulic Airwheel Brakes

(*Continued from preceding page*)
enough, and then I was in for it—ring around the mulberry bush. Finally someone sneaked up unexpectedly under me and let go. The engine stopped some of it, and then stopped itself; and my leg stopped one. That ended my career *over* Hunland and began it *in* Hunland. Dogfighting with a dead prop is quite a stunt."

Amory spent the next few months in German hospitals, seeing and hearing people die, principally from lack of medical attention, because in war nations devote more effort to mangling than to medicine. In fact, all of us spent so much money killing each other in the last war that we've found ourselves short of funds recently to send more missionaries out to China to civilize the Chinese and drag them up to our level of culture. Amory got so cultured in the war that after he got patched up he entered Harvard in 1920, and graduated in 1924 with such a high polish that there was only one thing for him to do—enter the great Boston firm of Lee, Higginson & Co. as a bond salesman, which he did in 1926, staying with that group of trusting bankers until Mr. Kruger, the Ponzi of Sweden, took them over the hurdles for a high dive into bankruptcy in 1932, proving that big bankers can be just as dumb as the rest of us who bought Cities Service. In 1931 Amory had joined the U.S.M.C. as a 1st Lt., so when high finance failed he got a year's active duty with the Marines at Quantico. He is now customers' man with Post & Flagg, New York, and undoubtedly will be rich just as soon as President Roosevelt leads us to that prosperity he used to mention before we elected him.

● WRITING OF the career of Howard F. Rough, Supervising Aeronautical Inspector of the Fourth Inspection District of the Department of Commerce, Bureau of Air Commerce, gives me the opportunity to pen a tribute to a group of pilots who are doing a splendid job in aviation. They don't often get their names in the papers, and they don't do any grandstanding or take part in any spectacular flights, but day after day and year after year they just keep on doing their jobs, keeping a firm guiding hand on aviation's destinies and doing it with minimum friction and maximum understanding. Acting as policemen, judge, and juries, from whose decisions there is no appeal, it would be easy for the Department of Commerce Inspectors to nourish a police court superiority complex; but they have never done this. On the contrary they have remained human and haven't tied aviation up in red tape. With their safe and sane control they have tamed the wildest; when they found one they couldn't tame, they grounded him until

Howard Rough

he cooled off and lost the wild glare of the inadvertent suicide. I wouldn't be surprised if the Department Inspectors have saved almost as many pilots as parachutes have saved. Yes, they're a fine group of men, and to know about their work is to admire them for the way they do it. And you know the Director of Air Commerce himself, the old Mahatma Eugene L. Vidal—he's working out very well too. For a government official to even stay sane down there in Washington is no mean feat, because Washington these days is so full of loonies that after a while even sensible people begin to doubt their own sanity and start acting like Congressmen.

Howard Rough was born in St. Joseph, Mo., on Jan. 31, 1891. This was the only important event in the history of St. Joseph, Mo., since April 3, 1882, when the Ford brothers shot and killed Jesse James. When Howard was four his family returned to Montreal, his father's birthplace. There Howard went to school until the age of 16 when he was sent to Ridley College, St. Catharines, Ont., and graduated in 1908 with good marks on the football and hockey squads. He could also read and write, more or less. He then enrolled in the University of Toronto, School of Practical Science, but they couldn't do much with him. They'd impart some scientific fact to him, but next day it wouldn't be there. After awhile it occurred to the faculty that there wasn't much use in filling Howard up with science every day, only to have it evaporate while he slept.

That being the case there was nothing for him to do but enter business, so in 1909 he got a job with the Oldsmobile Co. of Canada in sales and service work. The sales were not large, and the service was something less than half of that: all 1909 cars were guaranteed to get around the next corner, only. Howard soon transferred to the E. M. F. Co. as a racing driver, campaigning the Canadian fairs for two seasons, breaking several records and a picket fence and his racing car on the Exhibition Track at Toronto. He decided that he'd last longer if he merely sold the things. He lasted, but not as a sales manager, for at Vancouver in 1913, the E. M. F. Co. decided to struggle along without him and his sales record of one car a month. He went to San Francisco, spending the next year and a half selling Fords to the innocent motorists of those days, all of whom developed tremendous shoulder muscles from cranking. In fact, prizefighters of 1913 trained on Fords, building up immense hitting power.

Late in 1915 Howard favored the Willys Overland Co. with his high powered sales technique as factory representative at Indianapolis and later at San Francisco, where he suddenly found himself sold down the river as a married man, a fate that is continually overtaking gay bachelors, even to this day. He would have become a standard married man right then, but the war intervened to give him a two-years' vacation from family cares. He signed up and upon graduation from the School of Military Aeronautics at Berkeley late in December, 1917, proceeded to Rockwell Field, was put through the mill, and emerged as an instructor. In June, 1918, he went to March Field as an acrobatics instructor and soon after received orders for overseas with James (Autogiro) Ray. They landed at Issoudun and ran slap into the mud and Senator Bingham. There Howard stuck to instructing until the Armistice came to his aid, when the Army let him go home to explain to the folks why he wasn't plastered with medals.

In 1922 he loaned a friend a few dollars to help him out on a Texas oil deal, and was startled to learn that almost over-night his profits were several thousand per cent. With this capital he decided to become a conservative business man and embarked in the contracting business in Berkeley, Cal., and in the next several years constructed several apartment houses and some 50 individual houses. He even got paid for some of them. One purchaser traded in an old Jenny on a house; that was in 1926, and marked the beginning of the decline of one contractor. In 1927 he disposed of the remnants of his contracting business and joined Clarence Young's staff of inspectors the following spring. This was in the early stages of the Department, and when districts were laid out Howard Rough was made Supervisor of the Fourth District with headquarters at Detroit. Meanwhile his former partner in the oil business stuck to oil and is now rated several times a millionaire. But aviation is supposed to be more fun than the oil business.

Howard spent two years in the Washington office as Assistant and occasionally Acting Chief of Inspection Service, but returned to field work and his old post in 1931, where he's been ever since. He has over 3,000 hours in some 52 different types of ships. Considering the 17 years it has taken him to accumulate that time, it's no wonder he occasionally is nonplussed when last year's private or limited commercial pilot presents a log book showing more hours than that.

We are proud

Postal Telegraph
THE INTERNATIONAL SYSTEM
Commercial Cables · All America Cables · Radio

CHARGE TO THE ACCOUNT OF

Send the following message, subject to the terms on back hereof, which are hereby agreed to

B01 53 CABLE

BO SEATTLE WASHN 10HOAM OCT 23 1934

NLT COLONEL ROSCOE TURNER

MELBOURNE (AUSTRALIA)

THE BOYS ARE ALL PROUD OF YOUR OUTSTANDING ACCOMPLISHMENT AND FULLY APPRECIATE WHAT YOU AND PANGBORN HAVE DONE BY SUCCESSFULLY COMPLETING SO LENGTHY A FLIGHT OVER STRANGE TERRAIN WE ALSO APPRECIATE THAT YOU WERE FLYING A COMMERCIAL TRANSPORT PLANE WHERE DEPENDABILITY WAS FIRST CONSIDERATION IN DESIGN

BOEING AIRCRAFT COMPANY.

BY DIRECT WIRE FROM

WESTERN UNION

SIGNS
DL = Day Letter
NM = Night Message
NL = Night Letter
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram

CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable sign above or preced-ing the address.

EAJ22 22 VIA RCA=CD MELBOURNE OCT 24 1934

NLT BOEING AIRCRAFT CO=
SEATTLE (WASH)=

EVERY MEMBER YOUR ORGANIZATION SHOULD BE PROUD OF SUCH WONDERFUL AIRCRAFT AS WE USED REGARDS=
ROSCOE TURNER.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

BOEING

BOEING HAS ALWAYS BUILT TOMORROW'S AIRPLANES TODAY!

College Glider Clubs Active

RENEWED ACTIVITY among the various glider clubs organized at many universities, colleges and schools throughout the country is evidenced in reports from a number of institutions.

At Kent, Ohio, the Kent State Glider Club is preparing to compete with neighboring college clubs in a glider meet by getting additional time in its newly reconditioned ship.

More than 62 flights have already been made by members of the Case Aero Club of the Case School of Applied Science, Cleveland, in the Waco glider from Collinswood Glider Field.

A new glider club has been organized at the Carnegie Institute of Technology, Pittsburgh, Pa., and it is planned to purchase a glider which will be entered in the national meet at Elmira next year.

Students at Hiram College, Hiram, Ohio, already have purchased a glider and are flying from the Greendale Farm, near their city, using the auto-tow method of launching, while at the University of Cincinnati, activities were renewed after a lapse of a year. The club owns three gliders and is perfecting a light-weight radio for glider-to-ground communication.

Second Oklahoma Tour Completed

THE SECOND State Air Tour sponsored by the Aviation Club of Oklahoma City was completed, bringing to a close the dedication of 44 CWA airport projects in the state. There are now about 75 projects available in Oklahoma for emergency or regular landings.

More than 300,000 persons greeted this second tour of 41 planes, which, headed by Moss Patterson, president of the club, visited 10 cities during the two-day trip.

21 Planes In Arkansas Tour

THE SEVENTH Annual Arkansas Air Tour ended at the Arkansas Municipal airport after one of the most successful trips ever held. Almost perfect flying weather prevailed during the two-day flight and large crowds gathered at the airports to greet the planes.

The tour left Fort Smith and flew to DeQueen. From there the squadron of 21 planes flew to Texarkana. The feature event, a bandit hunt, was held between Texarkana and Arkadelphia, while at the latter city, a bombing contest was won by M. L. Short of Newark, N. J., a representative of the Standard Oil Company of New Jersey, who was flying a Monocoupe.

Aircraft Feature Drive

AVIATION MANEUVERS were a feature of the events which marked the launching of the Community Fund drive in Baltimore, Md. A fleet of fifteen privately-owned airplanes, under the leadership of Lieut. Col. W. D. Tipton, aviation officer of the Twenty-ninth Division, executed formation flying over the downtown section.

64 PLANES PARTICIPATE IN TREASURE HUNT

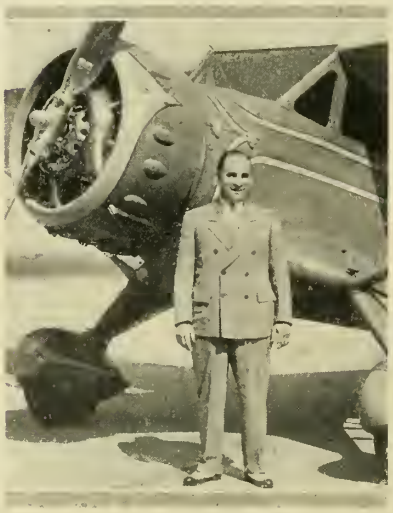
ONE OF the largest entries of aircraft for an aeronautical contest assembled at Holmes Airport, New York, when 64 planes participated in a Treasure Hunt while about 4,000 persons watched. The planes flew to airports within a 30-mile radius where various items were picked up and flown back to Holmes Airport. John Biusio won first prize and $250 of the $600 donated by Mrs. I. J. Fox.

Business Man Flies 99,782 Miles

MILTON REYNOLDS, president of Reynolds Appliance Corp., Chicago, Ill., up to September first of this year logged 800 hours and flew 99,782 miles in his Stinson Reliant while on business trips for his company.

Within a year he made three transcontinental trips, two round-trips from Chicago to Mexico, two to Miami, sixty over the Allegheny Mountains and four to Canada. He has landed at least once in every important airport in the United States, and is now planning a transcontinental trip which will take him to Detroit, New York, Richmond, Miami, New Orleans, Dallas, Los Angeles, San Francisco, Portland, Winnipeg and back to Chicago in about 10 days.

Although able to take the controls, Reynolds employs Gus Palmquist as his pilot.



M. Reynolds and his Lycoming powered Stinson Reliant

Aero Club Forms Aviation Committee

A STATE aviation committee is being established by the Birmingham Aero Club to provide Alabama with an active, coordinated aviation group, state-wide in composition, that is directly interested in aviation and can give specific attention to the state's aviation requirements. This committee will be composed of one representative from each town with an airport, either built or under construction.

Such a committee, it is felt, can render service to Col. Sumpter Smith and his air park program; to Col. Theodore Swann, State Aviation Commissioner, and to others engaged in developing aviation in the state. It can also cooperate with various towns in their aviation projects; can work for better air mail and airline facilities; and can give attention to many other details that affect aviation.

Officers of the club are: President, Asa Rountree, Jr.; vice-presidents, Edgar Stanford, Hayden Brooks, John Donaldson and Miss Blanche Toney; secretary-treasurer, D. E. Denney. The board is composed of 16 persons who are active in Birmingham aviation, while an advisory committee of 27 is made up of prominent business men and public officials.

32,000 See Wisconsin Shows

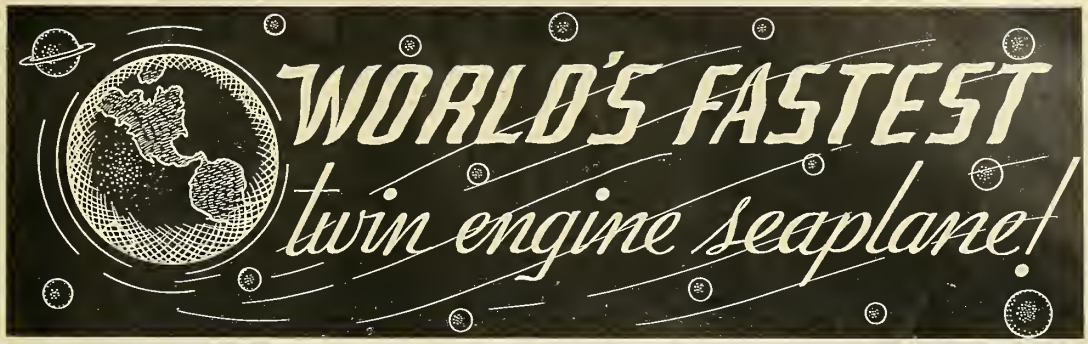
AN AIR circus sponsored by the Morris O. Togstad Chapter, Disabled American Veterans of the World War, attracted more than 2,000 persons to the Madison, Wisc., airport. Featured in connection with the show were S. J. Wittman, Oshkosh, who flew his monoplane at a speed of more than 200 miles an hour; Glenn Edward, parachute jumper; O. G. Corben, manager of the airport, who gave a bombing exhibition; Virginia Whittelsey, Sam Griesmer, Merle Buck and Harold Anderson, who raced.

Approximately 30,000 people were attracted to the Curtiss-Wright airport near Milwaukee to view the two-day Continental Air show sponsored by the Milwaukee County Council of the Veterans of Foreign Wars.

Gov. Horner Dedicates Ports

GOV. HENRY HORNER of Illinois flew to be present at airport dedications on two successive Sundays. A squadron of 13 planes called at four airports on the last Sunday in October. At the airports of Quincy, Dixon, Bloomington and Joliet, large crowds turned out for the ceremonies, while on the previous Sunday, Gov. Horner spoke at the dedication of new or rebuilt airports at Marion, Harrisburg, Danville, Peoria and Springfield.

The schedules were arranged by L. P. Bonfoey, chairman of the State Aeronautics Commission.



THE BELLANCA
BI-MOTOR SEAPLANE TRANSPORT

SPEED?—Yes!—But this fast Bellanca Bi-Motor Seaplane Transport is not built for speed alone. In addition, it has an immense useful load capacity—6210 pounds—ample to provide for 18 passengers that luxurious comfort characteristic of every Bellanca design and to accommodate mail, air express and baggage loadings that mean so much to profitable air line management. There's nothing clumsy about the way this big ship handles either; she gives exceptional performance in the air and in landings or take-offs. And, of vital importance to commercial transport operation, this high speed, large capacity Bellanca Bi-motor convertible seaplane is surprisingly economical to operate. Complete performance data and specifications now available.

BELLANCA AIRCRAFT CORPORATION

NEW CASTLE, DELAWARE

BELLANCA AIRCRAFT OF CANADA, LIMITED, MONTREAL

BELLANCA

NEWS OF THE SCHOOLS

High School Scholarships Planned

SUPPLEMENTING THE sixth annual W. E. Boeing aviation scholarship, the Boeing School of Aeronautics announces a Junior W. E. Boeing scholarship award for senior high school students in the states of California, Oregon and Washington. These scholarships consist of a two-year Airline Operations course with a tuition value of $1600, and a one-year Airline Mechanics course with 25 hours of flight instruction and a tuition value of $1200.

The scholarships will be awarded on the basis of an essay competition to be judged by the National Committee of Award for the Sixth Annual W. E. Boeing Scholarships.

The scholarship competition has been limited to high schools in Pacific coast states in an experiment to determine the best method of handling similar scholarships on a more extended basis in the future.

Students From Jones School On Tour

THE SENIOR Engineering class of the Casey Jones School of Aeronautics, Newark, N. J., made a three-day tour of the aircraft factories in the Philadelphia, Wilmington, Baltimore district to observe latest manufacturing practices. Factories visited were: Fleetwings, Inc., Bristol, Pa.; Kellett Autogiro, Pitcairn Autogiro, Budd Co., and the Naval Aircraft Factory, Philadelphia; Bellanca Aircraft, Wilmington and the Glenn S. Martin Co., Baltimore. Another group of students were taken through the Wright Aeronautical Corp. factory, Paterson, N. J., by Casey Jones and were guests of Guy Vaughan, president of the company, at a luncheon.

Rising Sun School Expands

DUE TO increased enrollment and production work, it has become necessary to erect another building at the Rising Sun Aircraft School, Philadelphia, Pa. The new building, in the form of an all-metal hangar consisting of approximately 6,000 sq. ft., will be placed alongside the present school building.

The sewing and fabric shop, plane assembly, rib and wing construction, wire splice tables as well as the wood work and dope spraying are to be handled in the new quarters.

The school now has an enrollment of 300 students and with the new addition will be able to accommodate twice that number.

SIXTH ANNUAL BOEING SCHOLARSHIPS OFFERED

TWO COMPLETE aeronautical training courses, with a tuition value of $5,800, have been announced as the awards for the sixth annual W. E. Boeing aviation scholarships offered to university, college and junior college students in the United States and Canada during the school year 1934-35 by the Boeing School of Aeronautics, Oakland, Calif., according to T. Lee, Jr., general manager. First award is a full Airline Pilot and Operations course and the second is the Airline Technician course. Scholarship competition will close March 15, 1935.

Library Attracts Many

CARLETON E. STRYKER, chief engineer for the Curtiss-Wright Technical Institute of Aviation, Grand Central Air Terminal, Glendale, Calif., little thought his classrooms would become the mecca for much of the west coast aviation industry when he began building up a library of technical books on aviation.

Engineers of different factories, professors in advanced schools of learning, mechanics from both inside and outside aviation activities and students from other schools are requesting permission to make use of the library which at present contains about every worth-while book ever printed in English which deals with aeronautical construction.

Ryan Planes Fly to Air Meet

THREE PLANES, including a Ryan S-T and two Great Lakes, represented the Ryan School of Aeronautics, San Diego, at the American Legion Air Meet held at Fresno, Calif., on November 10 and 11. Making the flight were John Fornasero, James Fornasero, Earl D. Prudden, Orva Johnson and Neal Wagar. One of the feature events of the Sunday afternoon program was an exhibition flight of the Ryan S-T with John Fornasero, Ryan chief instructor, at the controls.

Students Will Build Plane

AERONAUTICAL ENGINEERING students at Parks Air College, E. St. Louis, Ill., will, during their two-year course, be required to assist in the production of an airplane in the 1A Class. This involves designing of the plane, making of necessary blue prints and stress analyses, securing an approved type certificate and finally the building of the plane in the school shops and test flying.

The plan was adopted upon the recommendation of a number of aeronautical engineers and their assurance that it would provide the most practical engineering instruction.

Free Radio Course Offered

STINSON SALES & Service, Roosevelt Field, Mineola, N. Y., announce they will conduct a free course for licensed pilots in training for aircraft radio, including instruction in code and various subjects necessary to obtain an operator's license. Sessions will be held on Tuesday and Thursday evenings at 7 o'clock at the company's hangar, No. 17. Harwood Parks, radio engineer in charge of the Stinson Aircraft Radio Department, will be the instructor.

Hemke Heads Air Course in Troy

DR. PAUL E. HEMKE, former professor of aeronautics and mathematics in the post graduate school of the United States Naval Academy, Annapolis, has been appointed professor and head of the department of aeronautical engineering at Rensselaer Polytechnic Institute, Troy.

Ground School Courses Given

IN COOPERATION with Midwest Airways, the Milwaukee School of Engineering is conducting ground school classes covering all subjects for which written government examinations are required. Dwight S. Mills is chief tutor.

High School Gets Army Plane

LITTLE ROCK, Ark., high school will receive a Douglas observation ship of the 1931 series, from the 154th Observation Squadron, Arkansas National Guard. The ship will be dismantled and used for aviation instruction purposes. W. M. Cline, graduate of the army technical school at Chanute Field, is in charge of classes at the high school.

OUT where the West begins — on the flat open country of Oklahoma, at Tulsa . . . "Oil Capital of The World," is an institution that is more than a flying school — over a MILLION DOLLARS have been invested to make Spartan the premiere School of Aeronautics in America. You will like it out here . . . long days of sunshine that make flying ideal the year round. Any time—is The TIME to enroll at Spartan! You will like the way we are doing things here at Spartan and you will like the fellows that make up the DAWN PATROL—clear headed, ambitious to occupy the important places in aviation tomorrow, these are the students that will be YOUR flying mates. They come from every part of this country, North, South, East and West. From Mexico, Canada, and from China, Cuba, Columbia, Venezuela, and a score of other countries scattered over the globe.

These young men and women who now wear the wing insignia of the Dawn Patrol invite YOU to join them in the absorbing study of aeronautics here at Spartan. On the eve of a new year take the first step now toward a career in Aviation —tomorrow, America's First Industry, by sending for a copy of the new 1935 issue of the Spartan Catalog completely describing the SPARTAN 3 ★ ★ ★ STAR Courses offered by America's Outstanding School of Aeronautics.

MAIL THIS COUPON TODAY FOR A FREE COPY OF THE SPARTAN CATALOG

SPARTAN SCHOOL OF AERONAUTICS
P. O. BOX 2649, TULSA, OKLAHOMA

GENTLEMEN: Send me a copy of the NEW 1934 Spartan Catalog and Supplement describing in detail Spartan 3★★★ STAR Courses of Aeronautics, tuition prices and detailed living expenses:

NAME_____

ADDRESS_____

CITY_____ STATE_____

AGE_____ Any Previous Flying Experience?_____

Check below branch of aeronautics you are most interested in:

- ☐ FLYING
- ☐ MECHANICAL
- ☐ RADIO-INSTRUMENT
- ☐ EXECUTIVE-MANAGEMENT

Capt. Nelson Wins Mitchell Trophy

FLYING AT an average speed of 216.832 miles an hour over a four-lap, 5-mile course at Selfridge Field, Mich., Capt. Fred Nelson of St. Paul won the Mitchell Trophy from a picked field of nine other Army pilots, all of whom broke the old record.

The race was last flown in 1930 and Lieut. Cy Bettis won it then with a speed of 175.4 m.p.h. The slowest of the ten planes this year averaged 208.327 m.ph.

The Curtiss Trophy, offered for the first time, was won by Lieut. T. Graughen, Jr., of North Bend, Neb., who circled the 20-mile course three times at an average of 191.146 m.p.h.

The 50,000 spectators also saw Lieut. D. C. Doubleday of New York win the Junior Birdmen's Trophy by flying twice over a measured mile at an average speed of 240.3 m.p.h.

Navy Flights Help Agriculturalists

DAILY AEROLOGICAL flights made at the U. S. Naval Air Station, Anacostia, by Naval personnel, to obtain data of upper air conditions for weather forecast purposes, are used by the Department of Agriculture with studies of micro-organisms in the upper atmosphere.

These investigations, which are directed by F. C. Meier, representing the Weather Bureau and the Bureau of Plant Industry, continue work which he has conducted during the recent years in the course of training flights on the U.S.S. *Los Angeles* and ferrying flights of Navy, Coast Guard and Army airplanes.

The Instrument Division of the Weather Bureau is developing a device for attachment to a wing strut which, provided these preliminary results warrant further work, may be duplicated for use on planes engaged in meteorological flights at other points.

Air Base Development Anticipated

THE SAND Point Naval Air Base at Seattle, Wash., is expecting to enlarge its air fleet when the government assigns two squadrons of twelve planes each to base at this station. It is understood the government is planning to strengthen its aerial defences on Puget Sound and develop Sand Point through acquisition of adjacent acreage, although naval officials in the district have not yet received formal word of the development campaign that will augment the aerial strength of the Navy in this region.

NAVY TO COOPERATE IN FLIGHTS OF LZ-129

WITH THE approval of President Roosevelt, the Navy Department is ready to cooperate in a limited number of demonstration flights of the airship LZ-129, now building at Friedrichshafen. This cooperation will consist in allowing the dirigible to land at the naval stations in Lakehurst, N. J., or Miami, Fla.

Ranger Pilots in Air Show

TWO SQUADRONS from the U.S.S. *Ranger,* consisting of 18 planes of VB-5B and VB-3B flew over Richmond, Va., where a dive bombing attack was simulated on a race track where a crowd was witnessing an automobile race. On their return, the stunt team of Lieuts. Greber, Peck and Olney amused the crowd at a Navy service football game.

Anacostia Has Busy Month

THREE RECORDS were set during a recent month by flight personnel at the Naval Air Station, Anacostia, D. C., when 1,109 hours of flying time were logged in station aircraft which made 686 flights. In addition, there were 1,277 plane movements at the field.

75 Training at Hensley

THE PAST summer saw one of the best reserve officers' training schools ever held at Hensley Field, Dallas, Tex. Night flying was included and lectures given by Lieut. Col. Ira Longanecker of the 8th Corps Area station, Fort Sam Houston. Seventy-five men are now stationed at the field regularly and it is expected that more will be sent there soon.

Hensley Field is under the command of Capt. B. S. Thompson, who has expressed the hope that Federal funds will soon be available for the completion of the runways. Two runways of crushed stone were recently built and two more are needed. The runways are 200 feet by 3,600 feet.

Navy Trains 24 Reservists

TWENTY-FOUR members of the Naval Reserve have been selected for advanced flight training at the Naval Air Station, Pensacola, Fla. These men were of a group of 48 which was ordered to Pensacola for a month's primary training.

Capt. Rufus F. Zogbaum, Commandant at Pensacola recommended that 44 of the 48 be given advanced training, but Naval Reserve funds were not sufficient for that number. The men who were eliminated will be given priority next year.

Several thousand graduates of various colleges and universities made application to the Navy for aviation training, and it was from that number that the 48 men were chosen for the primary course at Pensacola. Upon their selection, they were enrolled in the Naval Reserve and those who are successful in completing the aviation training will be commissioned Ensigns in the Naval Reserve and ordered to the fleet for a period of active duty.

New Quarters For Missouri Guard

A TWO-STORY extension on the south side of the brick building of the 35th Division Aviation Missouri National Guard, now under construction at Lambert Field, St. Louis, will provide new club rooms for officers, main offices, garage and storage facilities. The old quarters will be converted into a club room and sleeping rooms for visiting air service men. The new building measures 48 × 72 feet.

The enlisted men's club rooms, in a one-story building about 150 feet from the main building, will be moved to the rear of the new extension. Major Phil R. Love is commanding officer.

P.&W. Trophy Won by Lt. Bertelson

THE PRATT & Whitney Altitude Trophy, donated by the Pratt & Whitney Aircraft Co., E. Hartford, Conn., and competed for at the Springfield, Mass., air meet recently, was won by Lieut. Norman W. Bertelson.

The trophy was competed for by National Guard squadrons from Boston and Hartford and was open to any pilot flying a P. & W. powered plane. The competition consists of a climb to 5,000 feet and return to the ground, the winner being the pilot who makes the best time.

AVIATION ENGINEERING
TECHNICAL EDITORS: GLENN D. ANGLE • DR. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

High Speed from Wind Tunnel Tests

ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics, New York University

● Benjamin F. Ruffner described in *Aviation Engineering* a method of estimating the high speed performance of an airplane from wind tunnel tests which has proved highly satisfactory. The procedure, briefly stated, is as follows:

1. The induced drag is assumed to be independent of scale effects, and to vary simply as $\rho S V^2$.

2. The profile drag of the wing and the parasite drag are determined by a test at or near the minimum drag of the model, with the induced drag deducted by calculation if necessary.

3. The model is tested for VL or scale effects, by running the wind tunnel at varying speeds with the model maintained at the same attitude of minimum drag. By plotting the minimum drag against the Reynolds' number, VL/ν on logarithmic paper, an equation is established for the profile drag and parasite drag of the form

$$R = C_1\, \rho/2\, SV^2/\left(\frac{VL}{\nu}\right)^n \quad \ldots\ldots(1)$$

where C_1 is an experimental constant for the condition of minimum drag, so that the resistance coefficient

$$C_r = \frac{R}{\rho/2\ SV^2} = C_1/\left(\frac{VL}{\nu}\right)^n = C_1/(R.N.)^n \quad \ldots\ldots\ldots\ldots(2)$$

where n has a small, fractional value.

4. Once the exponent n has been determined the drag of the airplane at any scale and speed, is determined from the equation

$$D = C_1\, \rho/2\ SV^2/\left(\frac{VL}{\nu}\right)^n + \rho/2 \left(\frac{C_L^2}{\pi\ (A.R.)}\right).\ SV^2 \quad \ldots\ldots\ldots(3)$$

in which the profile drag is added to the induced drag.

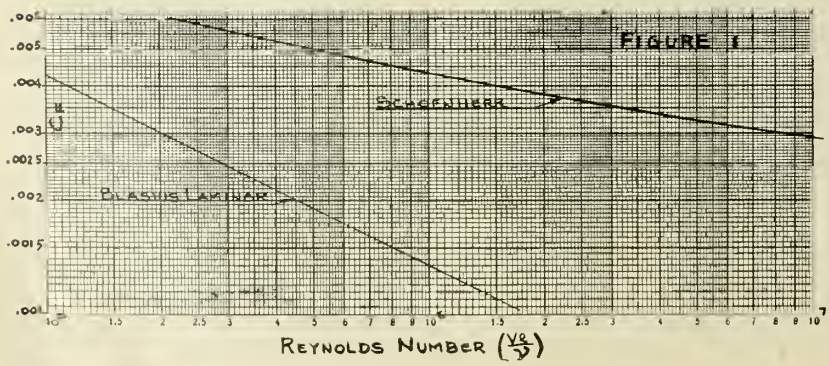
This method assumes, then, that the exponent n remains a constant no matter what value the Reynolds' number, VL/ν may have for the full scale airplane.

Model aerodynamics indicates that the exponent n itself varies with the Reynolds' number, and decreases with the Reynolds' number. The method therefore may be too optimistic for a very fast airplane or a very large airplane. It is proposed in the present article to modify the above method of high speed estimating, taking the variation of the exponent n into account.

Flat Plate Skin Friction Formulae

The well-known formula for the resistance of a body, having no lift, but where both density and viscosity are taken into account is

$$R = C\, \rho/2\, SV^2\, f\left(\frac{VL}{\nu}\right) \quad \ldots\ldots\ldots(4)$$



The equation is derived by methods of dimensional analysis, but $f\left(\frac{VL}{\nu}\right)$ has to be determined experimentally.

For a thin flat plate placed edgewise in the fluid, at so low a Reynolds' number that the flow is laminar and non-turbulent, Blasius has evaluated the viscous drag to be (for one side of the plate)

$$R = 1.328\ \rho/2\ .\ SV^2/\left(\frac{VL}{\nu}\right)^{1/2} \quad \ldots\ldots(5)$$

$$\text{and } C_f = 1.328/\left(\frac{VL}{\nu}\right)^{1/2} \quad \ldots\ldots\ldots(6)$$

For a flat plate at higher Reynolds' number, the flow is only smoothly laminar up to a certain distance from the leading edge. Thereafter the flow is substantially laminar but also becomes turbulent with temporal oscillations of velocity in all directions superimposed upon the general velocity which remains almost parallel to the wall of the flat plate. The boundary layer now thickens at a greater rate with the distance from the leading edge than in the non-turbulent region. Given a long plate, tested at sufficiently high air speed, it may be assumed that the flow is turbulent over practically the entire surface of the plate. In such a case, it is customary to call the resistance skin friction and to evaluate the skin friction on the basis of the formula derived by W. S. Diehl from Wieselberger's experiments:

$$R = .0375\ \rho/2\ SV^2/\left(\frac{VL}{\nu}\right)^{.15} \quad \ldots\ldots(7)$$

$$\text{and } C_f = .0375/\left(\frac{VL}{\nu}\right)^{.16} \quad \ldots\ldots\ldots(8)$$

In passing from the non-turbulent to the turbulent flow, we find that: (a) At the same value of the $R.N.$ the coefficient C_f becomes larger; (b) The coefficient C_1 of equation (2) becomes smaller; (c) The exponent n becomes smaller.

Without entering into a discussion of

this difficult subject, it will be sufficient to state that as the $R.N.$ increases still further, and the turbulent character of the flow is more definitely pronounced, C_1, and n decrease.

This explains why formulae of the type $C_f = C_1/(R.N.)^n$ established by different laboratories do not wholly agree. Such formulae hold approximately for a particular range of Reynolds' number, but *not* beyond that range.

"Universal" Skin-Friction Law

If log C_f is plotted against log (RN) then with a constant value of n a straight line plot should result. Thus in figure 1 where the log of the coefficient of laminar skin friction is plotted against the log of the Reynolds' number, a straight line with $-\frac{1}{2}$ as the slope results. If $C_f = (.0375)/\left(\frac{VL}{\nu}\right)^{.15}$ were a true formula independent of the range, then the logarithmic plotting of C_f for turbulent skin friction should result in a slope of $-.15$. If n decreases slowly with $R.N.$ then the straight line should become a shallow parabola.

This is precisely what Karl E. Schoenherr found in a paper before the Society of Naval Architects and Marine Engineers, when he ploted in one curve the results of the skin friction tests (as approximately indicated in figure 1) of many investigators, namely Zahm's early tests, Wieselberger's tests at Göttingen, Gibbons's at the Washington Navy Yard, Froude's in the National Water Tank, Kempf's in the Water Tank at Hamburg, etc. What is even more striking, in spite of the fact that both water and air were employed as the test media, and in spite of the fact that different methods of tests were employed in the various laboratories, a mean curve was established by Schoenherr of the form:

$$\frac{K}{\sqrt{C_f}} = \log_{10}(R.N.\ C_f) + M \ldots (9)$$

where K = 0.242
and M = 0

As the result of prolonged study of turbulence by the application of dimensional similarity Professor Von Kármán had previously established the formula:

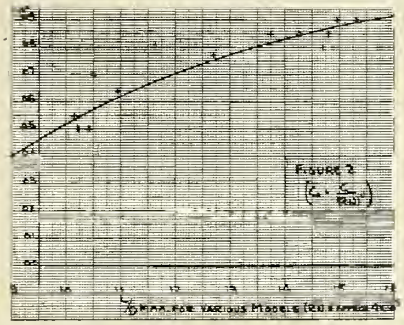
$$2^{\frac{1}{2}}/C_f^{\frac{1}{2}} = \text{const.} + (1/K)\log(R.N.\ C_f) \ldots\ldots (10)$$

There is therefore semi-empirical, semi-theoretical justification for a "Universal" law of turbulent skin-friction.

Moreover this "Universal" law agrees very closely with the local law $C_f = C_1/(R.N.)^n$ within a given range of Reynolds' numbers, although the constants K and M apply independently of such a range. The "Universal" law also decreases the value of n for a local range, as the Reynolds' number increases, as is shown by the logarithmic curve of figure 1.

Application to an Airplane Model

As stated previously, estimating high speed on the basis of the exponential law derived from a test in the wind tunnel has been quite successful. The values of the exponent n when plotted against the maximum L/D of different models have fallen reasonably well on a single curve of the character shown in figure 2. The cleaner



the ship the more its drag approaches pure skin friction, therefore the higher, invariably, the value of n.

Even in the Compressed Air Tunnel the Reynolds' numbers fall far short of the $R.N.$ of modern ships. It is evident that the process of scaling up by the simple exponent formula is bound to lead to unduly optimistic results. At the extreme hypothesis, $C_f = C_1/(RN)^n$ then when $R.N. = \infty$, $C_f = 0$, which is evidently absurd.

Obviously the "Universal" law of skin friction cannot apply with the same accuracy to a complex airplane model as to the simple flat plate. Nevertheless its application is reasonable, and above all conservative. The calculations are not difficult and merely involve fitting the tunnel exponential curve into the universal curve, to fix the universal constants K and M.

In the following example, a flying boat model was tested at substantially zero lift, through a range of Reynolds' numbers from 2×10^5 to 6×10^5, the model having a mean chord of 8.74 in. With coefficient of resistance referred to the wing area, the values in the tunnel were:

1. $C_f = .0188$ at $R.N. = 4.07 \times 10^5$
2. $C_f = .0602/(R.N.)^{.09}$ with $n = .09$

where $R.N. = \dfrac{\text{V (chord in feet)}}{\nu}$

The wing area of the full scale model was 10,300 sq. ft. and the mean chord of the full scale model was 43.7 ft. The power available at top speed was estimated to be 8,100 horsepower. The induced drag at top speed was found to be negligible.

In the calculation of top speed without scale correction

$$HP = C_f\ \rho/2\ SV^2\ \frac{V}{550},$$

where V is in ft./sec.
or $8130 = .0188\ (.002378/2)\left(\frac{10{,}300\ .\ V^3}{550}\right)$

From which $V = 269$ ft./sec. or 183 m.p.h.

In the calculation of top speed on simple exponential law,

$$HP = C_1\ \rho/2\ SV^2/\left(\frac{\text{V. chord}}{\nu}\right)^{.09}$$

$\frac{V}{550}$ and $\left(\frac{1}{\nu} = 6350\right)$

or,

$$8130 = (.0602)\ (.002378/2)\left(\frac{10{,}300\ V^3}{550}\right)[V(43.7)\ (6350)]^{.09}$$

From which $V = 315$ ft./sec. or 214.7 m.p.h.

In the calculation of top speed by application of the "Universal" law, and using the extreme Reynolds' number range of the tunnel test,

$R.N. = 2 \times 10^5 \qquad C_f = .0198$
$R.N. = 6 \times 10^5 \qquad C_f = .01825$

writing

$$\frac{K}{\sqrt{C_f}} = \log_{10}[(R.N.)\ C_f] + M$$

$$(a)\ \frac{K}{\sqrt{.0198}} = \log_{10}(2 \times 10^5 \times .0198) + M$$

$$(b)\ \frac{K}{\sqrt{.01825}} = \log_{10}(6 \times 10^5 \times .01825) + M$$

From the solution of a and b
$K = 1.493$
$M = 7.022$

So that the Universal Law in application to the model becomes

$$\frac{1.493}{\sqrt{C_f}} = \log_{10}(R.N. \times C_f) + 7.022$$

Substituting the full scale Reynolds' number of 8.46×10^7 and substituting varying values of C_f in this equation, it was found to be satisfied by $C_f = .01305$.

(*Continued on page* 40)

Theory, Design and Application of Engine Exhaust Collector Rings

JOSEPH SEAMONS

Chief Engineer, Solar Aircraft Company, Ltd.

● Modern transport planes have made the question of exhaust manifolds increasingly important, and since the majority of planes are radial, air-cooled engined, this discussion will be limited to exhaust manifolds as applied to this type of engine.

An exhaust manifold's chief function is the collection and disposal of exhaust gases. In addition, it is usually called upon to furnish heat to the cabin or cockpit, to the carburetor air intake, and to the mixture of air and gas leaving the carburetor. From the purely practical standpoint the manifold should weigh as little as possible, have a low initial cost, be easy to install, and have long life with minimum attention.

To function properly as a collector of exhaust gases, manifolds must have sufficient cross-sectional area to carry away the gases without imposing any appreciable back pressure on the cylinders. Engine manufacturers generally recommend that the back pressure on any cylinder should not exceed 4″ of water. The determination of what constitutes sufficient cross-sectional area, in lieu of actual pressure tests, is largely a matter of experience. An empirical formula that has given excellent results is:

$A = (.04)\ (P)\ (n/N)$ where,

A = minimum cross-sectional area required at any section (in sq. in.)

P = maximum engine horsepower

n = number of cylinders exhausting into the section

N = number of engine cylinders

When the manifold has a single outlet it is advisable to increase the outlet area about 10% over that given by the formula. A common mistake is to make a single outlet too small. In such cases pressure readings usually indicate high back pressures on the cylinders farthest away from the outlet and low pressures (sometimes negative) at the outlet section. This is bewildering at first because the sections furthest from the outlet usually have the greatest area/h.p. It would seem that these sections should have a lower pressure than the outlet section where the area/h.p. is smaller. Sometimes, in an effort to remedy this situation, the sections of high pressure are increased in area and, because the size of the outlet is left unchanged, there is no material reduction in back pressure.

The explanation is the law of physics regarding the behavior of gases; that is, other things being equal, the product of velocity × pressure remains constant. All the exhaust gases entering the manifold must pass through the outlet, and if the outlet is unduly small it offers a restriction to the passage of the gas which is reflected throughout the system. For every size of outlet there is a corresponding value of pressure × velocity which becomes greater as the area of the outlet is decreased. In sections where the area is larger in comparison to the volume of gas that passes through them, the velocity will be relatively low and the pressure high. As the gas approaches the outlet and the area becomes smaller, the velocity increases and the pressure decreases. Obviously, the remedy is to increase the size of the outlet.

Back pressures are affected by other factors. For example, (a) gas flow is not constant but pulsating; (b) there may be local restrictions; (c) some of the connections to the cylinders may introduce a turbulence; (d) some parts of the manifold (and hence the gas in it) may have more cooling than others. Nevertheless, when high back pressures are noted on cylinders farthest from the outlet and lesser pressures on cylinders near the outlet, it is evidence that the outlet is too small.

In making tests for back pressures, readings should be taken on a straight portion of the tubes connecting the cylinder exhaust ports to the manifold and as close as practicable to the port. Readings taken at other places in the manifold are often useful in determining the character of the gas flow, but they do not give an accurate determination of the actual back pressure on the cylinders.

The best outlet location is a subject of some diversity of opinion. The Army requires all manifolds to have but one outlet which, on single engined ships, must be located on the right side slightly below the center-line. The Navy has no fixed requirement, leaving the question of number and location of outlets largely to the manufacturer. Commercial operators have individual preferences. In general it can be said that there is no one best outlet location: it varies with the type of ship for which the manifold is intended, as does the question as to whether there should be one outlet or two.

In addition to the single right-hand outlet, the Army prefers to have all the gas flow in a counter-clockwise direction which is opposite to the engine's firing-order. A manifold of this type is shown in figure 1. The reasoning behind this preference is that since the propeller rotation is clockwise the slipstream behind it will rotate downward on the right side

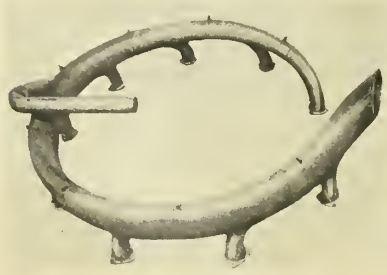


Fig. 1. Counter-clockwise manifold

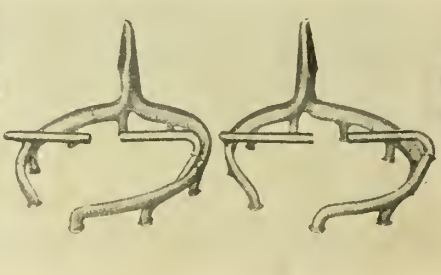


Fig. 2. Manifolds for Douglas Dolphin

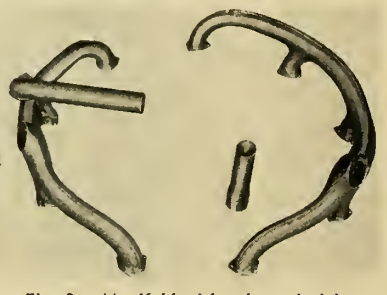


Fig. 3. Manifold with telescopic joints

and upward on the left. This being the case, exhaust gas from a right-hand outlet tends to be carried downward away from the cockpit while gas from a left hand outlet tends to be carried upward into the cockpit. Regarding the counter-clockwise gas flow, it is thought that if the flow is opposite to the direction of firing, the gas from one cylinder will be out of the way before the next one fires, thus reducing back pressure.

If the matter of weight were unimportant this type of manifold would be excellent, but often the increase in weight over other types is not justified by the results obtained. In some ships the slipstream rotation at the manifold outlet is considerable, while in others it is negligible. Insofar as gas in the cockpit is concerned, a right hand outlet seldom has any advantage over a left hand outlet.

Assuming that a single outlet is desirable in many cases, and other things being equal, placing the outlet on the right side is justified if only a slight advantage in gas distribution is derived. The single direction of flow on the other hand, is seldom beneficial, and in most cases is disadvantageous from the standpoint of weight. At operating speeds the interval between explosions is so short that, for practical purposes, there is a constant flow of gas in the manifold. The difference in pressure between clockwise flow and counter-clockwise flow is so small as to be hardly measureable. The slight reduction in back pressures that might possibly result from a single direction of flow does not justify the weight increase that almost invariably accompanies it.

Referring to figure 1, it will be noted that the section adjacent to the outlet must be large enough to carry the exhaust of eight cylinders, the next section large enough for seven cylinders, etc. Therefore, the sections near the outlet must be almost as large as the outlet itself, resulting not only in greater weight, but also due to the large manifold size, the necessity for providing considerable space which often produces the problem of interference between the manifold and other parts of the ship.

If the manifold were divided at a point approximately diagonally opposite the outlet (Figure 2) with the gas from five cylinders flowing in one direction and that from four in the other direction, then the sections adjacent to the outlet need only be large enough to accommodate the gas from four cylinders and three cylinders respectively, making possible smaller sections and therefore less weight. On the basis that both manifolds are made of 18 gauge material, the split type shown in figure 2 would weigh 5 lbs. less than the one with the single direction of flow (Figure 1). However, since the sections of the split type manifold are much smaller, it is possible to use 20 gauge material for most of it, thus saving about 10 lbs. Further weight reduction is possible by providing two outlets as shown in figure 3. Had this type been used in place of the one illustrated in figure 1, a saving of 20 lbs. would have resulted. In this case the two-outlet arrangement would have been suitable.

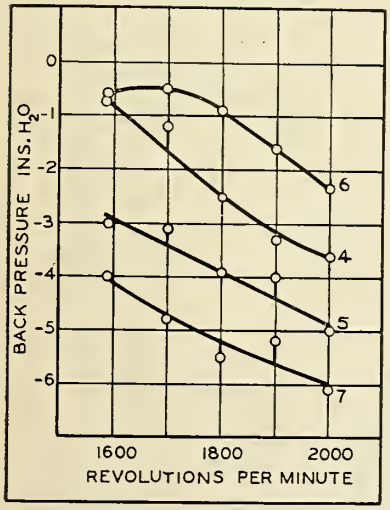
Outlet Arrangement

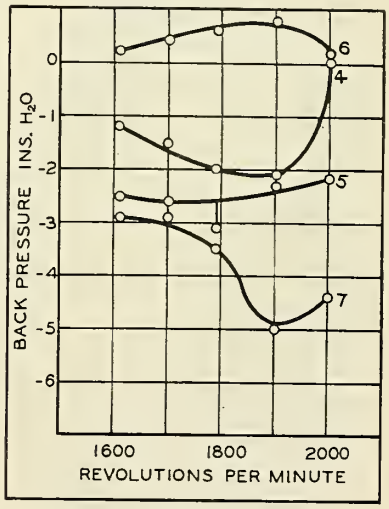
On multi-motored transport planes a single outlet is usually most satisfactory. In twin-engined planes it is often possible to place the outlet outboard on one engine and inboard on the other, thus permitting the manifolds to be interchangeable. If there are no hot spot connections or other similar attachments it is possible to determine an outlet location between any two adjacent cylinders which permits both manifolds to exhaust outboard (or inboard) and still be interchangeable. If hot spot connections must be provided, the only combination permitting the outlet to be in a corresponding location on both right and left engines and still be interchangeable is to place the outlet either directly on the top or bottom centerline.

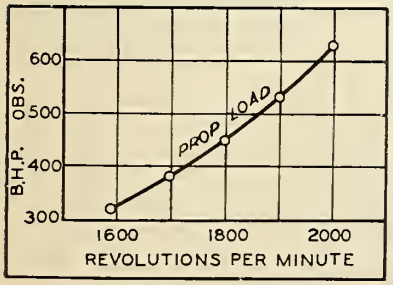
For most military and single-engined commercial planes it is possible to design a satisfactory manifold with two outlets. In such cases the manifold is formed of two halves. The nearer the outlets are to the center of these halves the lighter will be the manifold. To avoid fouling the wing or to prevent glare during night operations, it is desirable to place the outlets below the wings, bringing them at the lower end of each half as shown in figure 4. This combination is generally 5 or more pounds lighter than a single-outlet manifold.

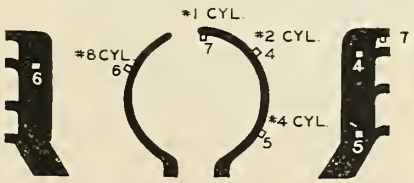
Form of Exhaust Rings

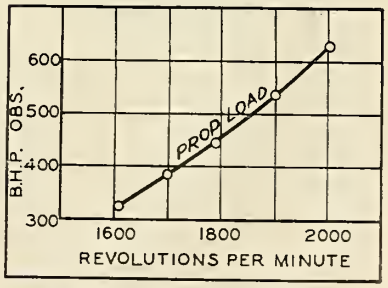
Manifolds tapered uniformly in cross-sectional area are not always the cheapest form of construction because they usually permit no interchangeable sections. However, they produce the lightest structures, and because the cross-sectional area increases in approximately the same ratio as the volume of gas to be carried, the flow tends to be more uniform. Sometimes the type shown in figure 1 is constructed with a constant cross-section











Check of back pressure exhaust collector ring for P. & W. engine with (left) and without (right) exhaust heater

throughout, making all sections identical, except the first section and outlet. However, since the cross-sectional area throughout the manifold must be the same as that of the outlet, weight increases tremendously.

Another method is to increase the area by sudden stages, in which case the first 3 sections are made with a constant area large enough to provide for 3 cylinders; then between the third and fourth cylinders the area is increased to a size large enough for 6 cylinders, this area being held constant for the following three cylinders, etc. This method does not reduce the cost of manufacture, and the advantages of having a few sections interchangeable are hardly justified by the increase in weight.

The circular cross-section is best, for it is stronger than any other shape of the same weight, cheaper to make, and (if supports are required) easier to support. When space between the inner and outer cowlings is small and the sections large, it may be necessary to flatten the manifold to a streamline or an elliptical shape to fit it into the space available. On deck-landing planes of the Navy where the pilot must look forward between the upper cylinders, it is desirable to flatten the upper portion of the manifold so as to increase the field of vision.

The theory is sometimes advanced that a streamline manifold produces less drag than one with a circular cross-section. Almost invariably the diameter of the manifold is less than that of the engine and therefore, except for a few engines with front exhaust, the manifold is behind the cylinders, in a disturbed area. The additional drag produced by the manifold is so small in proportion to the total drag of the ship, that there is no measurable difference in speed, regardless of whether the engine has no manifold or is equipped with one which is streamline or circular.

Where a cross-sectional shape other than circular is necessary, the curvature of the cross-section should be as great as possible, avoiding flat areas, which tend to fail because of fatigue resulting from constant flexing.

Number of Sections in Manifold

For engines of 9 cylinders (or less) it is desirable to provide a slip joint between each cylinder, giving the manifold as many sections as there are cylinders. This arrangement allows the manifold (and cylinders) to expand or contract in any direction under alternate heating and cooling without imposing a strain on the manifold or cylinder heads. Since each section is directly attached to one cylinder, it moves freely within the limits of the slip joint, independently of adjoining sections, and without restraint of any cylinder but the one to which it is attached. This feature also facilitates manufacture and simplifies installation, as the sections are smaller and easier to handle.

Fig. 4. Divided manifold

In double-row, 14-cylinder engines, a slip joint between each cylinder makes the sections too small for convenience, and it is better to provide a slip joint between each pair of cylinders (Figure 5). For installations in the Pratt & Whitney twin-row engines, the ports are recessed and provided with a sleeve into which the connections to the manifold are inserted. This is in effect a slip joint preventing cylinder-head strain which might be imposed by manifold expansion between adjacent cylinders. The Wright double-row engines are provided with conventional exhaust port flanges, and for these engines a slip joint is placed in the connecting tubes between the manifold and the cylinders. A joint of this type is also desirable on the Pratt & Whitney double-row engines because, unless it is possible to break these connecting tubes, their length (particularly those to the front cylinders) makes it difficult to assemble or dis-assemble the manifold on the ship.

Several types of slip joints are in use. Figures 2, 3 and 4 show a simple telescopic joint formed by inserting the end of one section into the end of the one adjacent. This is the cheapest and lightest type of joint and gives as good service as any other type. However, in order to remove one section it is necessary to remove several of the adjoining sections as well. The type used by the Army (Figure 1) consists of a sleeve over the joint held in place by a pair of lugs. To break the joint, the sleeve is slid around the manifold until the joint is free. This permits any section to be removed independently of the others and in general gives excellent service. Its chief drawback is that should the sleeves become slightly deformed or collect a coating of scale or corrosion, it is difficult to slide them around unless they are made with considerable clearance, in which case the joints are apt to leak. In addition, the lugs holding the sleeves in place, sometimes bend or break off.

Fig. 5. P. & W. double-row 14-cylinder manifold

The manifold shown in figure 5 is of the clamp type which permits removal of any section and has proven satisfactory. One end of the clamp and one end of each section are beaded, so that when the clamp is tightened the bead prevents slipping. The unbeaded end forms a slip joint. Its only disadvantage over the telescope joint is that it requires additional parts.

Removal of one cylinder without disturbing the manifold can be accomplished by providing a clamp-type joint in the connecting tubes as in figure 5, or a pair of flanges if desired, either being equally satisfactory. The flanges produce a rigid connection, while a clamp (or other form of slip joint) requires external support of the manifold to prevent it from slipping rearward off the joint.

The question of how and when to provide supports depends upon the particular installation. Pratt & Whitney has made it necessary to install supports on the twin-row engines and on their latest Wasps. These engines are provided with sleeve-type port connections instead of flanges. For engines with flange attachments, the necessity for supports depends on the distance from the centerline of the manifold to the port face and the weight of the manifold. If the distance and weight are considerable there is danger that the connecting tubes unsupported externally to the cylinders will fail adjacent to the flanges. Some engineers believe that if the manifold is supported by flanges there is danger of damage to the cylinder heads. However, observation of many manifolds indicates that connecting tubes fail long before there is any cylinder head distortion.

When the manifolds are rigidly attached to cylinders by flanges, external supports are sometimes detrimental rather than helpful. If the supports are attached to some part of the engine-mount structure, where the period of vibration differs from that of the engine, the manifold is subjected to a constant reversal of stresses that may be serious. It is desirable whenever possible to reduce

(*Continued on following page*)

FAIRCHILD SELECTS GOODRICH TIRES!

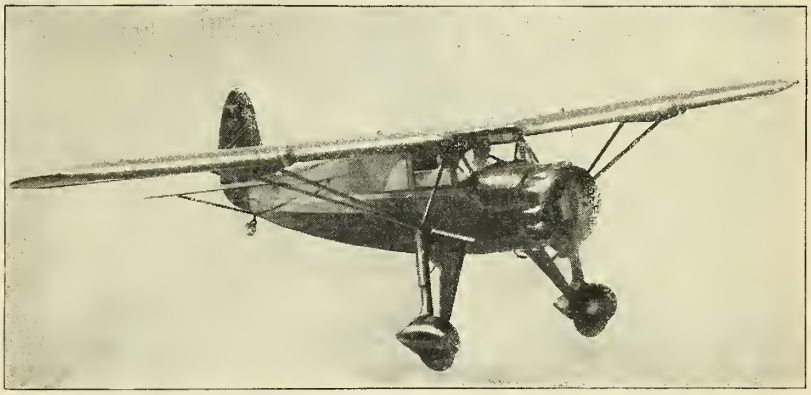
Equips Planes with low pressure Silvertowns for safe take-offs and cushion landings

FAIRCHILD engineers test carefully the material used in these quality planes. Beforehand, they must know the strength of every part. That goes for tires, too. It is significant that Goodrich Low Pressure Tires are standard equipment on Fairchild planes.

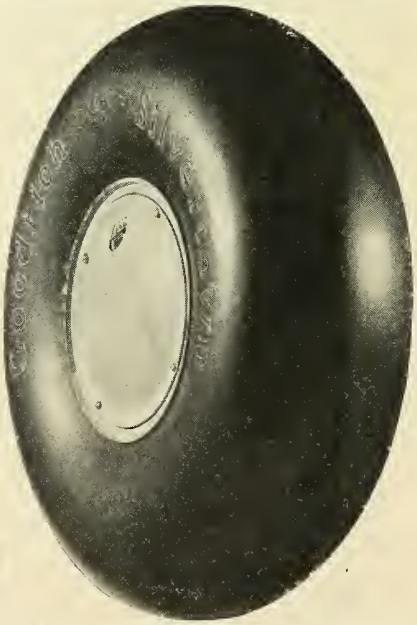
Goodrich Chosen for Dependability

The records of safe landings and take-offs on Goodrich Airplane Silvertowns testify to their greater strength. More and more planes are equipped with them for REAL PROTECTION — for consistent service under all conditions. No wonder commercial pilots as well as private flyers everywhere say these tires can "take it." They prefer them for their safety — for fast, sure take-offs and smooth cushion-soft landings.

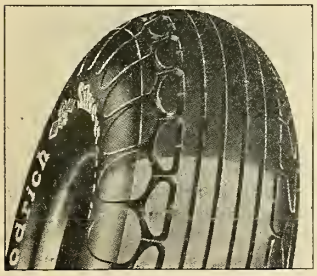
Play safe. Equip your planes now with Goodrich Low Pressure Tires. See your nearest Goodrich dealer without delay, or write Dept. 447, Aeronautical Division, of the B. F. Goodrich Co., Akron, Ohio, for complete information about Goodrich Airplane Products.



THE NEW FAIRCHILD CABIN "24" *The reliability of this ship has been demonstrated at airports from coast to coast. Equipped with Goodrich Low Pressure Tires for safe landings and take-offs.*



Whenever you fly, look at the tires. See how many times you take-off on Goodrich Airplane Silvertowns.



THE FAIRCHILD GYPSY "22"

The sportsman pilot feels complete confidence in this plane. The husky Goodrich Low Pressure Tires are one of its many safety features.

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes—including Tires—Tail Wheels—Abrasion Shoes—De-Icers—Matting —Rubber Hose—Grommets—Shock Absorber Cord—A Complete line of Rubber Aeronautical Accessories.

(Continued from preceding page)

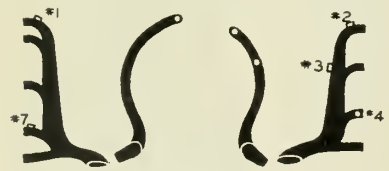
the weight and overhang of the manifold so that it can be supported solely by the cylinders. When supports are necessary, a slip joint should be provided in the connecting tubes to absorb differences in vibration between the engine and the points of support. Cowling and structural arrangements of different ships vary widely so that one type of support can not be regarded as appropriate for all installations. In general the best results are obtained by some form of clamp around the manifold such as shown in the installation on the Boeing airplane, illustrated in figure 6.

Heating Hot Spots and Cabins

Manifolds are designed to furnish heat for carburetor intake hot spots and for other purposes. Figures 1 to 5 inclusive, show hot spot connections without flapper valves. Flow through the hot spot is produced by attaching the connections so that the intake side leads off against the flow through the manifold, and the outlet side leads off in the direction of flow. This produces a difference of pressure between the two sides of the hot spot and causes gas to flow through it.

In some installations excellent results are obtained when the outlet side of the hot spot side is open to the atmosphere (Figures 1 and 3). The engine is ordinarily operated with the hot spot either full on or completely off, in which case to shut off the hot spot a plate must be inserted between the pair of flanges on the intake side, and the plate removed when heat is desired. If it is necessary to reduce the flow through the hot spot without shutting it off entirely, a plate with the proper size hole can be inserted to give the desired flow. This type of control rarely gets out of order and is considerably lighter than any flapper valve.

There are two methods of heating the air before it enters the carburetor; one is by enclosing a portion of the manifold with a muff (Figure 7) and the other by inserting a so-called "intensifier tube" inside the manifold (Figure 8). A muff (as ordinarily designed) supplies enough air to take care of the total carburetor needs. Enough of the manifold then must be enclosed to heat the total volume to the proper temperature. An intensifier tube supplies a small volume of air at a high temperature which serves to heat the incoming cold air.



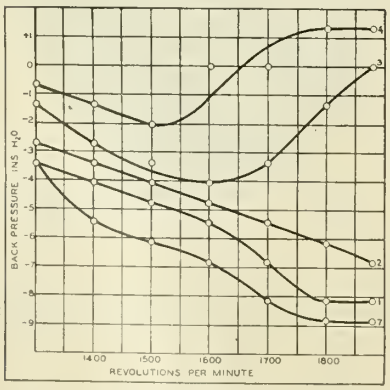


Chart showing check of exhaust back pressure in P. & W. Hornet engine collector ring

Fig. 7. Air heating muff for P. & W. Wasp Junior engine

Fig. 8. Douglas DC-2 manifold for Wright Cyclone

Both these methods are also used to supply cabin or cockpit heat. A muff, usually made of aluminum, is 5 pounds or more lighter than an intensifier tube, but on the other hand, it occupies considerable space.

There are cases where the manifold has burned through under a muff, allowing flames from the exhaust to be sucked through the muff into the carburetor. If the manifold is properly constructed and the muff provided with a by-pass so that when the hot air valve to the carburetor is closed the hot air is free to escape into the atmosphere, the possibility of fire resulting from a muff is remote. If there is constant circulation of air through the muff, the portion of the manifold enclosed by it will usually be cooler than the unenclosed portion.

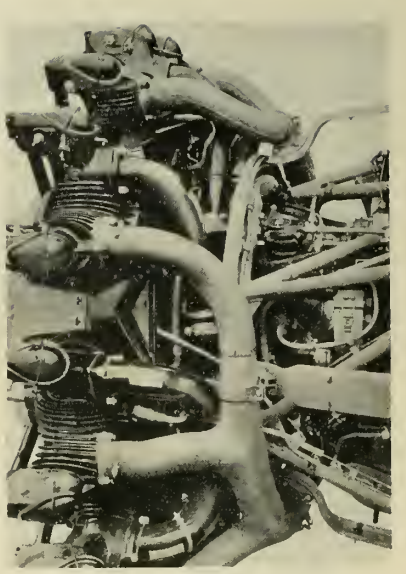
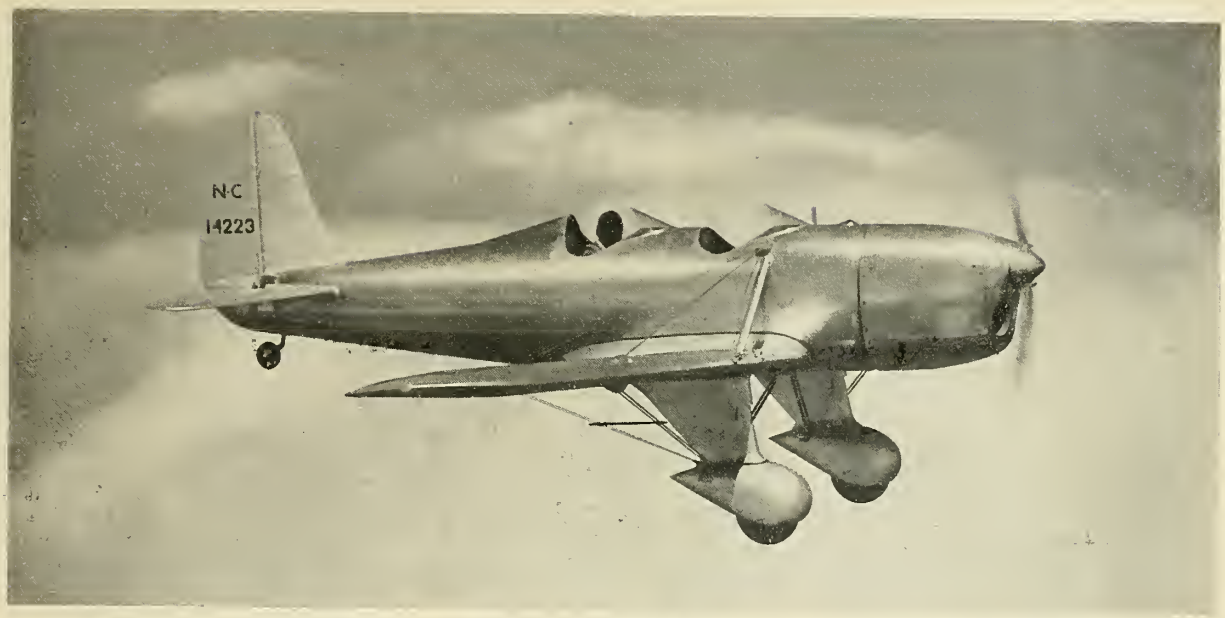


Fig. 6. Clamps around the manifold to support it from the plane structure

A by-pass is also necessary in an intensifier tube installation, and care must be taken to sufficiently increase the cross-sectional areas of the manifold to compensate for the space occupied by the tube to avoid high back pressures.

Various Metals Available

Of the various metals available for exhaust manifolds, the grade of stainless steel known as 18-8 seems most satisfactory. Experiments are now being conducted with *Inconel,* an alloy containing 75% nickel and 10% chromium. However, the latter is more expensive than stainless steel which also is costlier than most grades of steel. In addition, stainless steel is somewhat more difficult to weld than mild steel, its expansion coefficient is twice as great and its heat conductivity only half. Stainless steel is ductile in the annealed state but it work-hardens more rapidly than mild steel, making it more susceptible to cracking under continual vibration. Therefore a stainless steel manifold must be properly annealed after fabrication to relieve any work-hardening it may have had in the fabricating process. Improper methods of fabrication sometimes start the growth of intergranular corrosion, rendering the material valueless. Despite these handicaps, properly constructed manifolds of 18-8 stainless steel will last almost indefinitely with little or no upkeep expense; the material will not scale below 1700° F., (which is higher than temperatures likely to be encountered from exhaust gases) and it will not corrode to any appreciable extent, even when used on seaplanes.



A New RYAN S-T is on the line!

HERE is the plane which has been acclaimed as aviation's outstanding achievement for 1934—the New Ryan S-T—with its famous Menasco engine, its cruising speed of 120 MPH, its top speed of 140 MPH and landing speed of only 38 MPH. Designed and built by the Ryan Aeronautical Company at San Diego, primarily as a super sport plane, one of these Ryan S-Ts has been purchased by the Ryan School of Aeronautics and added to its fleet of modern training planes for your instruction.

A course of aeronautical training at RYAN is more than is indicated by the school's 176 hours of flying with 10 hours of 5-place cabin, 10 hours of amphibian instruction from the adjacent waters of beautiful San Diego bay, 10 hours of night flying, 10 hours of blind or instrument flying with radio beam instruction, thousands of miles of cross-country experience over the majestic mountains, valleys, and ocean shore of southern California,—and a complete Airplane and Engine Mechanics Course of 1,000 hours.

Enrollment at RYAN is an educational experience wherein the lure and broadening advantages of travel are combined with the pleasure of a glorious winter in San Diego—where the interest of flight instruction is heightened by contact with the daily activities of the 400 planes in the government's largest aeronautical operating base at North Island—and where students are in contact with the manufacture of the world's most modern aircraft, ranging from the latest type of sport planes to the large luxury airliners for commercial use.

COME TO SAN DIEGO 1935 THE CALIFORNIA CALIFORNIA Pacific International EXPOSITION

Your Christmas gift this year might be a RYAN course of instruction. Why not check the coupon and write today for the beautiful Ryan 40 page illustrated catalogue? It may help you sell an idea!

RYAN SCHODL DF AERDNAUTICS,
Lindbergh Field, San Diego, California
Gentlemen:

I am interested in the courses checked: Please send additional information.

☐ Transport Pilot	$1795	☐ Mechanics Course	$175
☐ Limited Commercial	585	☐ WEEMS NAVIGATIDN Home Study Course	100
☐ Private	585		
☐ Amateur	295	☐ Aircraft Welding	100

☐ Ryan deluxe Combination Course of Transport training plus new Ryan S-T high performance plane.....$4242

NAME..... AGE.....

ADDRESS.....

CITY..... STATE.....

DEPT. OF COMMERCE Approved HIGHEST TRANSPORT RATING

RYAN SCHOOL OF AERONAUTICS
Lindbergh Field
In Sunny SAN DIEGO, CALIFORNIA

Application of the Polar Diagram To Tapered Beams

DON J. NAUMANN

For a beam of uniform cross-section, the precise equations of bending moment and shear are:

$M = C \cos (x/j - e) + f(w)$ . . (1)

$S = -(C/j) \sin (x/j - e)$ . . . (2)

Plotting Equation (1) in polar co-ordinates with $M - f(w)$ as radius vector and x/j as angular co-ordinate, the resulting curve is a circle with the diameter C passing through the origin making an angle e with the reference line. Then, if a circle with radius $f(w)$ is drawn with its center at the origin, the radial distance between the arcs within the angle x/j represents the internal bending moment. The shear times j is represented by the distance from the extremity of the diameter to a point on the circle with diameter C. The point on the circle corresponds to a point on the beam.

Since each section of the tapered beam is distinct from the others, the composite diagram contains as many circles as sections, each circle being applicable in its respective section. Only that part of the circle which lies within the angle representing the section is drawn on the diagram. Because the conditions at the end of one section are diametrically similar to those of the adjacent section, the relative locations and magnitudes of the apices are fixed by the following considerations:

1. The bending moment immediately to either side of a dividing line is identical.

2. The shear immediately to either side of a dividing line is identical except,

This article presents the analysis of beams tapered in cross-section and subjected to axial compression and complex lateral loads. A study of this method by the engineer dealing with such problems should be warranted by the possibility of accurately determining the stresses in tapered beams. The illustrations show the basic graphical construction. Fundamentally, the procedure consists of dividing the beam into small sections and drawing a polar diagram for each, the section being made small enough so that the moment of inertia may be assumed constant within its length.

3. If a concentrated load acts at the dividing line, the shear changes by W.

The shear at the dividing radius of a polar diagram is equal to the perpendicular distance from the dividing radius to the apex of either adjacent angular section divided by the value of j corresponding to the apex. Therefore the distances from a common dividing radius to the apices of adjacent sub-bays are in the ratio of the values of j of the sub-bays. When a concentrated load acts at the dividing line, the ratio is changed by adding Wj to the numerator. Assuming W to act immediately to the left of the dividing line, the ratio becomes $(j_L + Wj_L) / (j_R)$.

Rules Nos. 1 and 3 of the *Rules of Construction* obtain the proper relative location of the apices perpendicular to the dividing radius. They are valid for all cases except when the running load is uniformly varying. In that case Rule No. 4 must be substituted. The relative location of the apices parallel to the common dividing radius is fixed by the difference between the $f(w)$ terms of the precise equations of the adjacent sub-bays. This difference equals $(w_R j_R^2 - w_L j_L^2)$ where the subscripts denote values corresponding to the right and left of the dividing line. Rule No. 2 results in the above relative location of the apices when the running load is uniform, uniformly varying, or uniform with abrupt changes.

With the location of an apex with respect to the other apices determined, the location of all the apices can be found if one of them is known. The major part of the construction is directed toward this end.

Construction

Figures 1 to 5 are illustrations of the construction at the dividing radii for several types of loads. In order to simplify the explanation, they contain three sections only. Most problems will require from ten to fifteen sections.

When solving a problem, the stress analyst will follow the construction described for one of the examples but will repeat the procedure at the dividing radii as many times as is necessary. For example, if his beam is tapered in cross-section with a uniformly varying load, he will use the method of figure 3 but will repeat the adjustments at the divid-

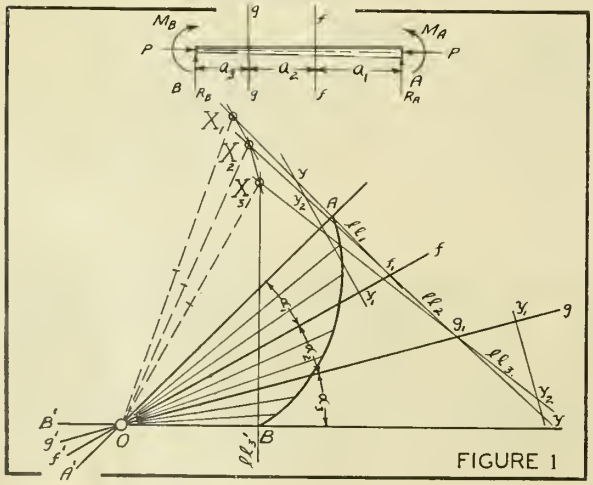


FIGURE 1

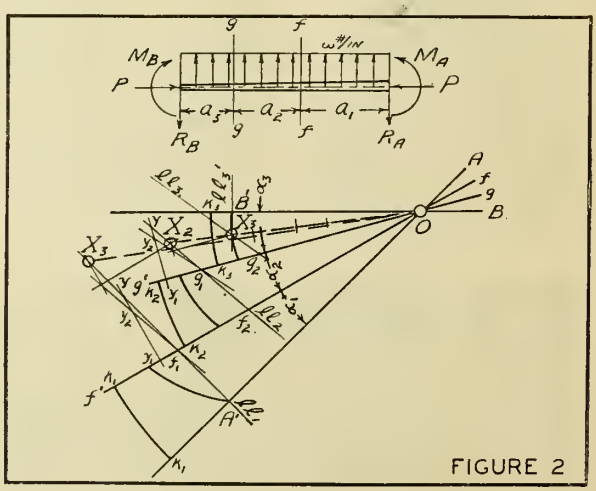


FIGURE 2

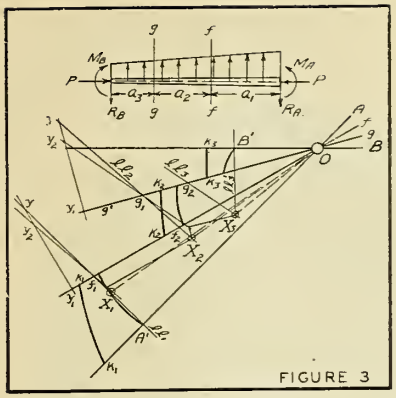


FIGURE 3

ing radii ff' and gg' at the dividing radii of his problem. The general procedure for analyzing is as follows:

a). Divide the beam into such sections that there are no discontinuities of loading within any section and $(a/j)57.3$ is between 11° and 12° for each.

b). Lay out angles representing the sections, letting the horizontal line BB' denote the left support.

c). Draw arcs of wj^2 in each angular division.

d). From O, the origin, lay out OA and OB equal to m_A and m_B respectively.

e). Construct normals ll_1 and ll_n, at A and B respectively.

f). In figure 1. (no side loads, unequal end moments), extend ll_1 to intersect ff' at f_1. Rotate ll_1 about f_1 to obtain ll_2 the locus line of the next section. Extend ll_2 to intersect gg' at g_1, rotate about g_1 to obtain ll_3 which intersects ll_3' at X_3, the apex of the leftmost section. X_2 is at the intersection of ll_2 and a line through X_3 perpendicular to gg'. Similarly, X_1 is at the intersection of ll_1 and a line through X_2 perpendicular to ff'. With OX_1 OX_2 and OX_3 as diameters, draw arcs in the corresponding angular sections.

In figure 2 (uniformly distributed side load, unequal end moments), extend ll_1 to intersect ff' at f_1, rotate about f_1, and displace parallel to ff' to obtain ll_2, the locus line of the next section. Extend ll_2 to intersect gg' at g_1 rotate about g_1, and displace parallel to gg' to obtain ll_3 which intersects ll_3' at X_3. To find remaining apices, draw a line through X_3 parallel to gg' to intersect the rotated but not displaced locus line ll_2. Through this intersection draw a line perpendicular to gg' to intersect ll_2 at X_2. To find X_1, draw line parallel to ff' through X_2 to intersect the rotated but not displaced locus line ll_1. Through this intersection draw a line perpendicular to ff' to intersect ll_1 at X_1. With OX_1, OX_2, and OX_3 as diameters, draw arcs in the corresponding angles.

In figure 3 (uniformly varying side load, unequal end moments), substitute Rule No. 4 for Rule No. 1 and follow same construction as for figure 4. When concentrated loads occur, the average loading over the section should be substituted for varying one and the construction for figure 5 followed.

In figure 4 (several concentrated loads, unequal end moments) extend ll_1 to intersect ff' at f_1, rotate about f_1 and displace perpendicular to ff' to obtain ll_2, the locus line of the next section. Extend ll_2 to intersect gg' at g_1, rotate about g_1, and displace perpendicular to gg' to obtain ll_3 which intersects ll_3' at X_3. To locate X_2 draw a line perpendicular to gg' to intersect ll_2 at the desired apex. X_1 will be at the intersection of ll_1 and a line perpendicular to ff' through X_2. With OX_1, OX_2 and OX_3 as diameters draw arcs in the corresponding angles.

In figure 5 (uniformly distributed side load with abrupt changes, concentrated loads, unequal end moments), extend ll_1 to intersect ff' at f_1, rotate about f_1, displace parallel to ff' to f_2 and displace perpendicular to ff' from f_2 to f_3 to obtain ll_2. Extend ll_2 to intersect gg' at g_1, rotate about g_1, displace parallel to gg' to g_2, displace perpendicular to ff' from g_2 to g_3 to obtain ll_3. The intersection of ll_3 and ll_3' locate the apex X_3. Through X_3 draw a line parallel to g_3g_3 to intersect the rotated but not displaced locus line ll_2. Through this intersection draw a line perpendicular to gg' to intersect ll_2 at X_2. Through X_2 draw a line parallel to f_1f_3 to intersect the rotated but not displaced locus line ll_1. Through this intersection draw a line perpendicular to ff' to intersect ll_1 at X_1. With OX_1, OX_2 and OX_3 as diameters, draw arcs in the corresponding angular sections.

g). The true bending moment is represented by the radial distance between the arcs. When there is no running load,

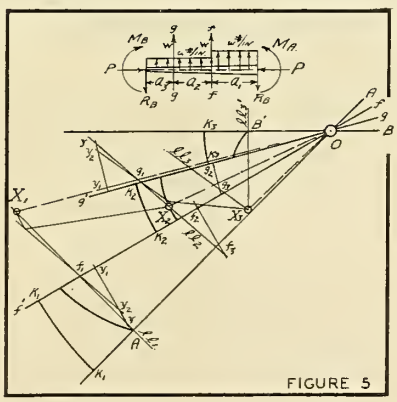


FIGURE 5

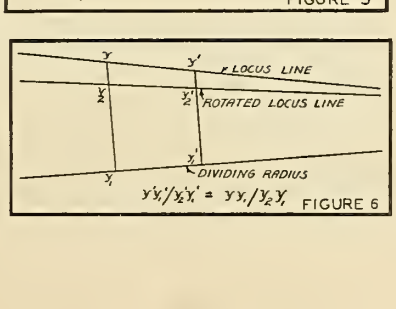


FIGURE 6

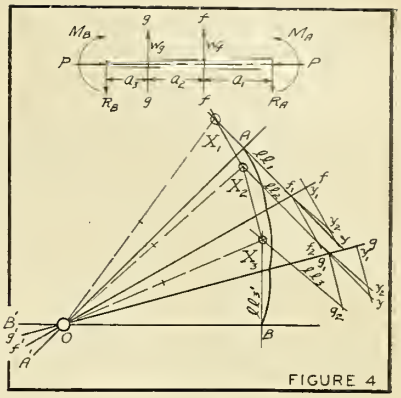


FIGURE 4

the arc representing wj^2 is considered as having shrunk into the origin O and the bending moment is measured therefrom.

The shear equals the distance from a point on the arc with diameter OX to the apex divided by the value of j corresponding to the apex.

When constructing the diagram, the intersection will often be found to occur outside the boundaries of the drawing board. In that case the rotation and displacement must be made without the intersection. Figure 6 is an illustration of the locus line ll_2 intersecting the dividing radius gg' off the paper. The rotation is effected by dropping perpendiculars from any two points on ll_2 to gg', dividing them as specified in Rule No. 1 and drawing the rotated position of ll_2 through the division points on the perpendiculars. To effect the displacements of ll_2, a point g_1 is chosen on the rotated locus line and the *Rules of Construction* applied there.

The stress engineer will find after a little experience with the polar diagram that he can determine the lengths of the sections quickly, especially if the moment of inertia is plotted against the length of the beam. With the exception of small deep beams with thin web members where the shear deflection may be large, 12° is small enough for the angular divisions.

In the case of a tapered beam the angle pi no longer determines the angle of instability of the beam. The critical angle may be greater than pi. This angle is determinable and is left as an exercise for the interested reader.

Rules of Construction

1. *Rotation of Locus Line.* From any point y on the locus line drop a perpendicular yy_1 to the dividing radius. Locate a point y_2 on yy_1 so that $yy_1/y_2y_1 = j_n/j_{n+1}$ and draw the rotated position of the locus line through y_2 and the intersection of the locus line and the dividing radius.

2. *Displacement Parallel To Dividing Radius.* From the intersection of the locus line and dividing radius mark off the distance $(w_Rj_R^2 - w_1j_1^2)$. At this

distance from the intersection, draw the displaced locus line parallel to the rotated locus line.

3. *Displacement Perpendicular To Dividing Radius.* Mark off the distance Wj_n perpendicular to the dividing radius and draw the displaced locus line parallel to the rotated locus line.

4. When the running load is uniformly varying, the rotation of the locus line is made in the same manner as in Rule No. 2 except that the ratio (j_n/j_{n-1}) is cubed.

The conventional signs of the polar diagram are used when making any displacement. (Ref. 1.)

Symbols and Nomenclature

a, Length of section (or sub-bay) in inches

I, Moment of inertia at any spar section.

j, $\sqrt{(EI)/P}$

E, Modulus of elasticity of the beam.

L, Length of the tapered beam.

11, Locus line, a line on which the apex is known to lie.

m, $(M - wj^2)$

M, True bending moment at any section.

O, Origin on the diagram.

P, Axial load (pounds).

S, True shear.

w, Running load on beam (lbs./in.).

W, Concentrated load (pounds).

x, Distance from the left end of any section to a point within the section.

X, Apex, point from which the shear is measured. Loading arcs are drawn with OX as diameter.

Loading Arc, Section of a circle drawn with OX as diameter.

Base Arc, Arc with radius wj^2 and center at O.

References

Reference 1: *Stresses In Aeroplane Structures*, by H. B. Howard.

Reference 2: *Airplane Structures*, by Niles and Newell.

Reference 3: *Analyzing Wing Beams by Means of Polar Diagrams*, by Raymond H. Schwartz, *Aero Digest*, July 1934.

Reference 4: *Applications of the Polar Diagram*, by Mr. Atkin, *Flight*, September and October, 1932.

WIND TUNNEL TESTS

(*Continued from page* 31)

Then writing

$$81300 = (.01305)\ (.002378/2)$$

$$(10{,}300)\ \frac{V^3}{550}$$

it was found that

V = 304 ft./sec. or 208 m.p.h.

The three methods gave therefore: (a) without scale correction, 183 m.p.h; (b) with scale correction on the Universal Law, 208 m.p.h.; and (c) with scale correction on the Simple Exponential Law, 214.7 m.p.h.

For this extreme case of scale correction on a 1/60 scale model it is clear that the extra trouble of applying the Universal Law is quite worth while, because it is likely to give a closer and more conservative result.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Lubricating Oils

A Contribution to the Study of Lubrication. Measurement of the Coefficient of Friction for Lubricating Oils and Their Constituents (Contribution a l'étude du graissage. Mesure du coefficient de frottement des huiles de graissage et de leurs constituants), Madeleine Briault. Publications Scientifiques et Techniques du Ministère de l'Air, No. 46, 1934, 29 *pp.*, 6 *figs.*, 15 *curves.*

CHARACTERISTICS WHICH may be of value in evaluating lubricating oils for airplane engines are discussed. The author outlines various methods of measuring the coefficient of friction of lubricating oils and describes the modified Woog frictometer which was used in the reported experiments. Curves of coefficient of friction against temperature are given for linseed, poppy-seed, hempseed, cotton-seed, colza, ground-nut, olive and castor oils, myristic, palmitic, oleic, and ricinic oleic acids, glycerine, ricinic oleate of ethyl and palmitate of butyle. The tests proved that the addition of 0.1% to 2% of fatty acids to mineral oil is sufficient to lower the friction coefficient.

Airplane-Automobile

The "Avion" Automobile, R. Tampier. Aircraft Engineering, Vol. 6, *No.* 68, *October,* 1934, *pp.* 265-267, 10 *figs.*

AN AIRPLANE for the private owner which is adapted for running on roads under its own power is described by its designer. The airplane is designed to travel on the ground tail first, having an auxiliary engine mounted behind the aero engine, which may also act as a starter. The author gives a design of steering gear for the front road wheels, the wheels being taken off before flight and fixed in the fuselage while the steering gear is folded under the fuselage.

Avigation Instrument

A New Device for Rapidly Calculating an Astronomical Point aboard an Airplane (Un nouvel appareil de calcul rapide du point astronomique à bord d'avion), Capt. Guyot. L'Aèronautique (L'Aèrotechnique supplement), Vol. 16, *No.* 184, *September,* 1934, *pp.* 73-81, 10 *figs.*

NAVIGATION METHODS of Marcq, Favé and Brill are explained and the operations in determining a point in the flight of an airplane by observation of the stars are analyzed. The author describes the Guyot apparatus in detail and its simple method of operation. This device is composed of a time calculator, tables giving the azimuth and height of the stars at a central point on a chart, and a marker. From readings of the watch and sextant, but without any calculations, a circle may be traced giving the relative height of the star observed.

Aerodynamics

Motion of a Stretched String in a Turbulent Flow of Air, D. Nukiyama. Tokio Imperial University — Aeronautical Research Institute — Report No. 112, *Vol.* 9, *No.* 4, *September,* 1934, *pp.* 77-100, 1 *fig.*, 57 *equations.*

DISTURBANCES ACTING on a wire stretched in the open air are discussed and simplified to bring them within the range of mathematical calculation. The author desired to ascertain whether the aerial tone could be explained by the Schrot effect. He shows that a disturbance causing vibration on a calm day is due to the heat of the sun's rays striking the wire which heats the air immediately surrounding it, setting up convection currents and the change of buoyancy which generates a periodic motion causing an aerial tone. Similarly, on a rainy day, the convection currents of heated air are replaced by water droplets of equal radius.

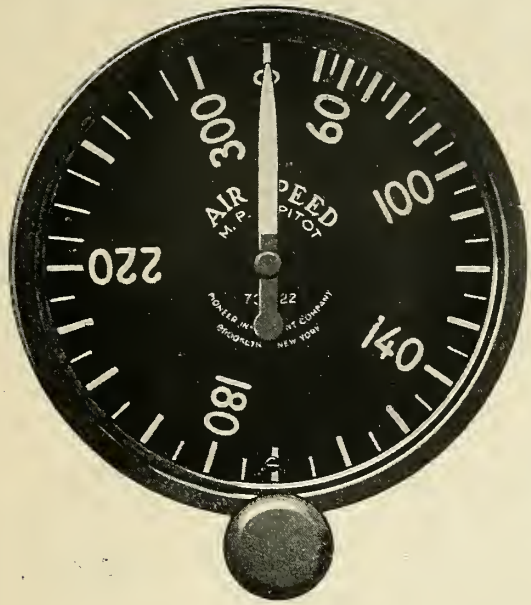
Wind-Tunnel Turbulence

The Effect of a Contraction on the Turbulence in a Fluid Stream, A. Fage. (British) Aeronautical Research Committee—Reports and Memoranda No. 1584, *November,* 1932-33 (*published September* 18, 1934), 8 *pp.*, 4 *tables,* 3 *figs. on supplementary sheets.*

CHANGES IN the maximum longitudinal and lateral velocity fluctuations due to a large contraction were determined for both water and air streams by a method involving the use of the ultramicroscope, the contraction being of the same type as that used in wind-tunnel design. Measurements made on the axis showed that the maximum longitudinal velocity disturbances were not greatly changed by contraction, and that the maximum lateral velocity disturbances were reduced roughly in the ratio of the outlet diameter to that of the inlet. The result differs from the theoretical consideration of the behavior of a single vortex passing through a contraction.

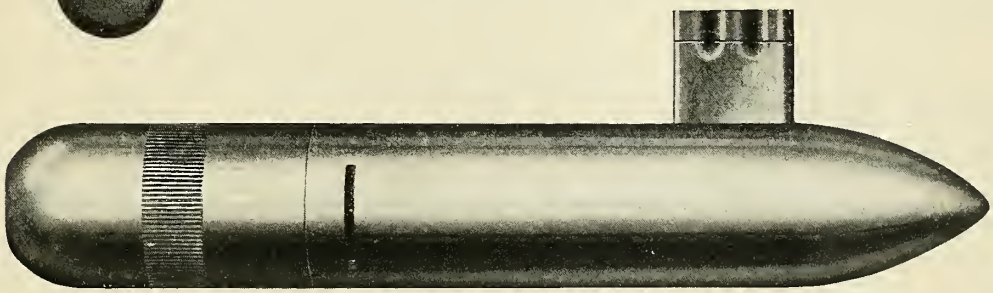
(*Continued on following page*)

PIONEER ROTATABLE AIR SPEED INDICATOR and ELECTRICALLY HEATED PITOT STATIC TUBE



ROTATABLE AIR SPEED INDICATOR *Type* 735 is an essential instrument, carefully designed to be quickly and easily read in conjunction with other instruments of the flight group. It is usually placed immediately to the left of the Turn Indicator...the Climb Indicator being placed on the opposite side.

The mechanism may be rotated so that when a predetermined air speed has been attained, the pointer assumes a horizontal position on the right hand side of the dial...The Rotatable Airspeed Indicator employs the same high grade mechanism used in all standard Pioneer instruments. Available ranges, 200 to 300 MPH.



ELECTRICALLY HEATED PITOT STATIC TUBE, *Type* 357D... positively prevents ice formation at low temperatures, thus insuring operation of the Air Speed Indicator at all times...It is an established fact that within a certain low temperature range, ice will rapidly form on various parts of an airplane. The Pitot Static Tube, because of its small dimensions, may be rendered completely ineffective often before the airplane itself has been seriously affected by the ice load. Concurrently with this ice forming condition, low or zero visibility is usually encountered, making it necessary for the Pilot to depend entirely upon his instruments. The perfection of the Heated Pitot Static Tube makes possible reliable airspeed indication, regardless of temperature. To provide for various methods of mounting, Pitot Static Tubes, type 357D are offered in three models. All three models have the same Pitot Static section as illustrated above.

PIONEER INSTRUMENTS

PIONEER INSTRUMENT COMPANY INCORPORATED

BROOKLYN • NEW YORK • A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

(Continued from preceding page)

Stalling Research

Stalling, B. M. Jones. Royal Aeronautical Society Journal, Vol. 38, No. 285, September, 1934, pp. 760-770.

RESEARCH CAMPAIGNS upon the stalling of an airplane, which began with the Wrights and have continued since, are discussed. The author believes that while they have shown the nature and causes of the movements of the stalled plane and have indicated simple ways of overcoming the dangers, they have been unsuccessful in explaining causes of minor differences between types. In his opinion, one reason is to be found in the sudden flow changes occurring on some parts of the wings in some stages of the stall. One purpose of the paper is to show why the presence of these sudden changes is not revealed by usual methods of experiment. He thinks that, on full scale, examination of flow by some simple method easily applied in flight will be necessary for investigating the causes of unsatisfactory behavior at low speeds so that the forms of wing liable to sudden flow changes in any of their parts may readily be recognized.

Wilbur Wright Memorial Lecture.

Turbulent Flow

Note on the Use of the Interferometer for Recording Turbulent Flow, L. F. G. Simmons and C. Salter. (British) Aeronautical Research Committee—Reports and Memoranda No. 1454, February, 1932 (published October 29, 1934), 3 pp., 11 figs.

IN THE experiments described, an interferometer was used to reveal the motion in a jet of carbon-dioxide gas issuing from a small tube. Spark photographs were taken with a monochromatic fringe system and also with white-light fringes widely separated to give a nearly uniformly illuminated field. The photographs reproduced show the parallel form of the jet at low speeds, the transition from laminar to turbulent flow, and the expansion which took place at a short distance from the tube when the velocity reached about 700 cm. per sec.

Airplane Strength Tests

Study of a Method Utilizing the Coupling between Two Oscillating Systems for the Determination of the Mechanical Strength of Structures and the Measurement of the Modulus of Elasticity (Etude d'une methode utilisant le couplage entre deux systèmes oscillants pour la détermination de la résistance mécanique des constructions et la mesure des modules d'élasticité), P. le Rolland and P. Sorin. Publications Scientifiques et Techniques du Ministère de l'Air, No. 47, 1934, 178 pp., 49 figs.

THE METHOD of coupled pendulums is applied to the study of the identification and mechanical ageing of airplanes. The authors discuss an experimental study they have made of problems in the strength of materials and then apply the same method to proving the strength of completed airplanes. They consider the tests useful in buying a number of planes of the same type from a manufacturer to prove that they all possess the same mechanical qualities. Also if an airplane of known "mechanical constant" has to be repaired, the tests would indicate that the repairing was satisfactory. By systematic tests after each flight, the eventual variation in the rigidity of the airplane could be studied.

Aileron Tests

Wind Tunnel Tests on (1) Frise Aileron with Raised Nose (2) Hartshorn Ailerons with Twisted Nose, A. S. Hartshorn and F. B. Bradfield. (British) Aeronautical Research Committee—Reports and Memoranda No. 1587, February, 1934 (published September 18, 1934), 13 pp., 2 tables, 8 figs. on supplementary sheets.

THE AILERONS were tested in an investigation to provide a closely balanced aileron which could be used to large angles and which was not sensitive to differences in rigging. The modified form of Frise aileron with raised nose was considered safer than the standard form in that it avoided the danger of overbalance for small errors in rigging and was lighter for large aileron angles. Rolling moments were not appreciably affected by raising the nose. The twisted-nose ailerons gave a more linear hinge-moment curve than the Frise with raised nose and were lighter for large aileron angles.

Aerodynamics

The Drag of Streamline Bodies, Hilda M. Lyon. Aircraft Engineering, Vol. 6, No. 67, September, 1934, pp. 233-239, 10 figs. Bibliography.

THE RELATIVE importance of skin friction and pressure in relation to full-scale design is treated in a highly mathematical manner. The author concludes that the boundary measurements show conclusively that the wide difference between the drag coefficients for two models in the normal tunnel is due to a difference in the position of the transition from laminar to turbulent flow caused by a different pressure distribution. She believes that a sphere of a diameter comparable with that of the airship would be needed to determine the relative "percentage turbulence" of the atmosphere for comparison with wind-tunnel measurements. This is important also in comparing wind-tunnel and full-scale measurements of the maximum lift of airfoils.

The same issue of *Aircraft Engineering* (pp. 245-246) contains an article by L. Bairstow entitled "Skin Friction Correction" which gives a resume of investigations into the boundary-layer theory and summarizes knowledge on the subject. The latter paper was presented before the Institution of Naval Architects.

Seaplane Floats

Hydrodynamic Experiments on Models of Seaplane Floats (Esperienze idrodinamiche di modelli di galleggianti d'idrovolante), A. Eula. L'Aerotecnica, Vol. 14, Nos. 8-9, August-September, 1934, pp. 947-990, 17 figs. and tables.

RESULTS OF tank tests on 17 models of hulls and floats of various types, which were made at free incidence, are discussed. Although the experiments were not undertaken systematically, some conclusions may be reached regarding the form of floats and their resistance. Adimensional diagrams are given for all models, covering values for residual weight, incidence, and relative resistance referred to either the total or residual weight. It was found that the best hulls, under normal conditions of loading, had a maximum hydrodynamic resistance which was slightly below 20% of the total weight while, for twin floats, the percentage was a little higher.

Fuselage Stresses

Some Calculations on the Stresses induced by Gusts in the Fuselage of a Particular Airplane. H. R. Fisher, (British) Aeronautical Research Committee—Reports and Memoranda No. 1581, January 31, 1934 (published September 7, 1934), 18 pp., 7figs.

THE CALCULATIONS reported were made to determine the behavior of a particular airplane when flying fully loaded at 116 m.p.h. into a gust perpendicular to the wing chord with a velocity which increases linearly along the flight path. It was found that a gust of 30 ft. per sec. would not be capable in the assumed conditions of adding in any member examined a load of more than 0.23 of its estimated strength. Sudden tail forces due to irregular air motions not amenable to calculation would have their efforts reduced by about 50% in the front bay of the rear fuselage, because of the inertia of this part and the tail.

Seaplane Water Resistance

Measurement of the Full Scale Water Resistance of a IIIF Seaplane in Steady and Accelerated Motion, E. T. Jones. (British) Aeronautical Research Committee—Reports and Memoranda No. 1591, December 6, 1933 (published September 14, 1934), 30 pp., 18 figs. on supplementary sheets, 14 tables.

FULL-SCALE water resistance of the seaplane was measured to determine how closely the law of corresponding speeds, applied to the results of models tested in a tank, predicts full-scale resistance. It was found that float resistance at speeds between 0.3 and 0.8 of take-off speed was almost constant and equal to about one-fifth of the displacement at rest. At the same attitude, full-scale resistance was about 10% higher than that of a one-tenth scale model. Curves of resistance in accelerated motion, determined by the direct and indirect method, were in fair agreement.

Fairchild XC-31 Cargo Transport

● The Fairchild XC-31 is a general purpose military transport, high-wing, braced-type monoplane with ample size cabin space and large loading door for bulky cargo.

The plane is also equipped for transportation of air-cooled and liquid-cooled V or in-line engines on standard army cradles. For transporting troops, provisions have been made for the installation of 15 Army-type chairs, or if preferred, the folding side benches which form part of the cabin side walls, can be opened to accommodate 14 men, while their equipment can be stored and tied down in the aisle between the benches. Another feature is the cargo chute, which permits aerial delivery of food and other items in containers by parachute.

The plane, which has provision for one pilot only, can readily be converted into an ambulance by installing litter support brackets, provision being made for quick installation of detachable brackets for six litters, three on each side of the cabin. In addition several Army-type chairs can be installed to accommodate attendants and additional patients.

In flight, the ship is easy to handle and the take-off is fast for a large ship. To date, this plane is one of the largest single-engined planes built, yet in light load tests, it could be landed, with flaps down from an altitude of 750 ft., and brought to a complete stop after covering a total straight line flight distance of less than a half mile from this altitude.

The plane is equipped for radio transmitting and receiving units and a type A4 radio compass. The radio mast is detachable from the inside of the cabin.

The size of the cabin (or cargo space) is approximately 19′ long × 6′ 4″ wide × 6′ 6″ mean height, totaling about 775 cubic feet. The floor level at the loading door is 4′ above the ground to simplify loading and unloading from trucks backed up against the door, and the loading door opening is 5′ 10″ × 4′ 11″. Round celluloid windows give ample light in the cabin during the day, while three dome lights illuminate the cabin at night. A small folding invoice desk is in the cabin, and a chemically dry toilet is situated aft.

Construction Details

The fuselage is of welded chrome molybdenum steel tubing, with tie rod bracing in most of the upper, lower and cross panels. This type of construction was used since it permitted a square interior and was most adaptable for the door opening desired. Gusset plates, tie rod lugs and fittings welded to the fuselage structure are of chrome molybdenum sheet and bar steel. The superstructure for pilot's windshield, floor, seat, instrument board support, etc., are of chrome molybdenum tubing, welded to the fuselage proper, and all fuselage fairing is of metal. Every part of the cargo transport is corrosion-proof.

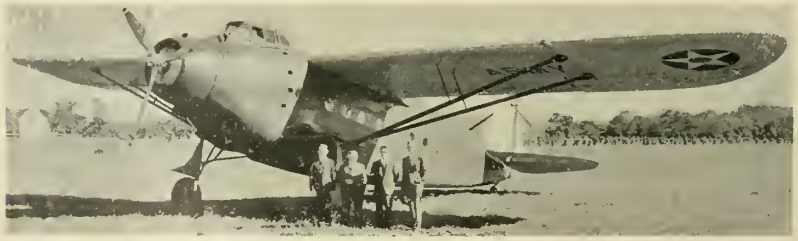
The cantilever stub wing is also of chrome molybdenum steel tubing with steel fittings throughout. The center truss, between front and rear stub wing spars, serves also as a skid in the event of a forced landing with wheels in the retracted position. Saddle fittings, and bushings welded to the fuselage structure, provide the means of attaching the stub wing to the fuselage.

The landing gear is fully retractable into wells in the bottom of the fuselage, the landing gear struts retracting into recesses in the bottom of the stub wing. Operation is either by an electric motor or by hand. The landing gear is equipped with 40 × 10 wheels, hydraulic-type brakes with star wheel adjustment and 40 × 10 streamline tires. Stub axles are pressed, fitted and bolted into shock strut end fittings, and the shock strut is a combined hydraulic and pneumatic type with splined cylinder and piston. Impact loads are dissipated through the hydraulic unit, while taxying loads are absorbed pneumatically within the strut.

A position warning device consisting of a solenoid vibrator mounted on the left rudder-brake pedal was developed for this ship by the U. S. Army Air Corps. Whenever the landing gear, or one side of the landing gear, is not in a safe position for landing, the vibrator warns the pilot as the engine is throttled prior to landing. A landing gear position indicator is on the instrument board. The tail wheel knuckle is of the Army-designed half-fork type, and the shock strut unit in the tail wheel is of the Aerol Oleo type.

The strut-braced wings (permitting greater fuselage cargo-space) are constructed of metal, fabric covered, and spars are of the single, solid web type, with extruded angles as flanges. The wing nose is metal, covered and reinforced by longitudinal stringers, riveted to the metal cover and the nose ribs. The entire metal leading edge is riveted directly to the front spar flanges, giving greater torsional rigidity and strength. In static tests, a 5-foot section (tested in high angle of attack position) successfully withstood a sandbag load of 3850 lbs. Wing ribs are of channel section cap strips and square aluminum alloy tubular truss members connected by aluminum alloy forgings and rivets. The drag system consists of welded drag trusses of chrome molybdenum steel tubing, heat treated after welding, and square steel tie rods doubled.

"Zap"-type flaps are of all-metal construction, hinged at the leading edge to the sliding cross head and at the hinge



Kreider-Reisner officials and engineers responsible for the Fairchild transport

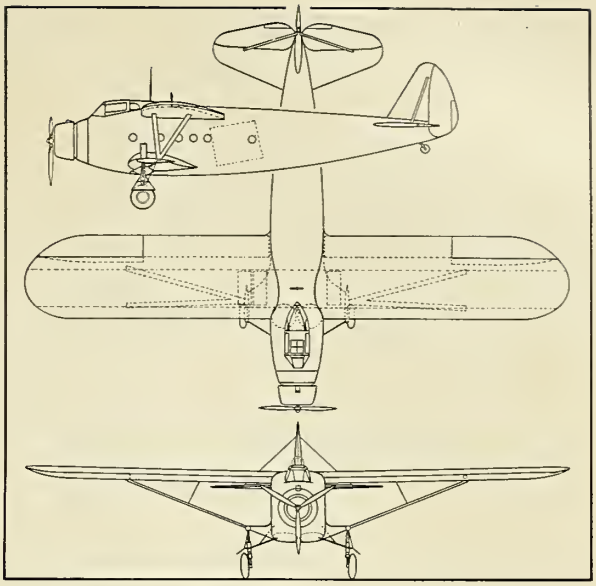
joints, spaced 30 inches apart, by tubular connecting rods to rear fittings of the flap-supporting beam. Flap connecting joints are along the flap at 30 in. intervals. In operation of the flap either mechanically by electric motor, or manually, the leading edge slides back and the trailing edge down simultaneously. Switches and flap position indicators are mounted on the dashboard.

Flap support beams are 30 inches apart and bolted to the upper and lower flange of the rear spar and to the drag truss fittings. Fuel tanks, of 75 gallons capacity each, are installed in the wing, one tank in the left and two in the right panel. Tie down fittings are also in the wing and are accessible through a door in the upper front lift strut fairing. Inspection doors and hand holes have been provided at points requiring frequent inspection.

Lift struts are constructed of streamline aluminum alloy tubing with strip type alloy steel attachment fittings bolted in place. The front lift struts have a fixed length, while the rear struts are adjustable on the upper end for rigging.

Ailerons are of the Frieze type. The skeleton is constructed of aluminum alloy with sheet metal nose, fabric covered. The differential movement of the aileron is 40° up and 15° down. The operating mechanism in the wing is incorporated in the center bracing bracket, and connecting rods are adjustable, plus and minus.

The vertical stabilizer is of all-metal cantilever construction bolted rigidly to the fuselage structure. The rudder is of aluminum alloy with sheet metal nose and fabric covered. A tab for directional trimming has been provided at the trailing edge. Hinges are ball bearing and elevators are fabric-covered aluminum alloy with sheet metal nose.



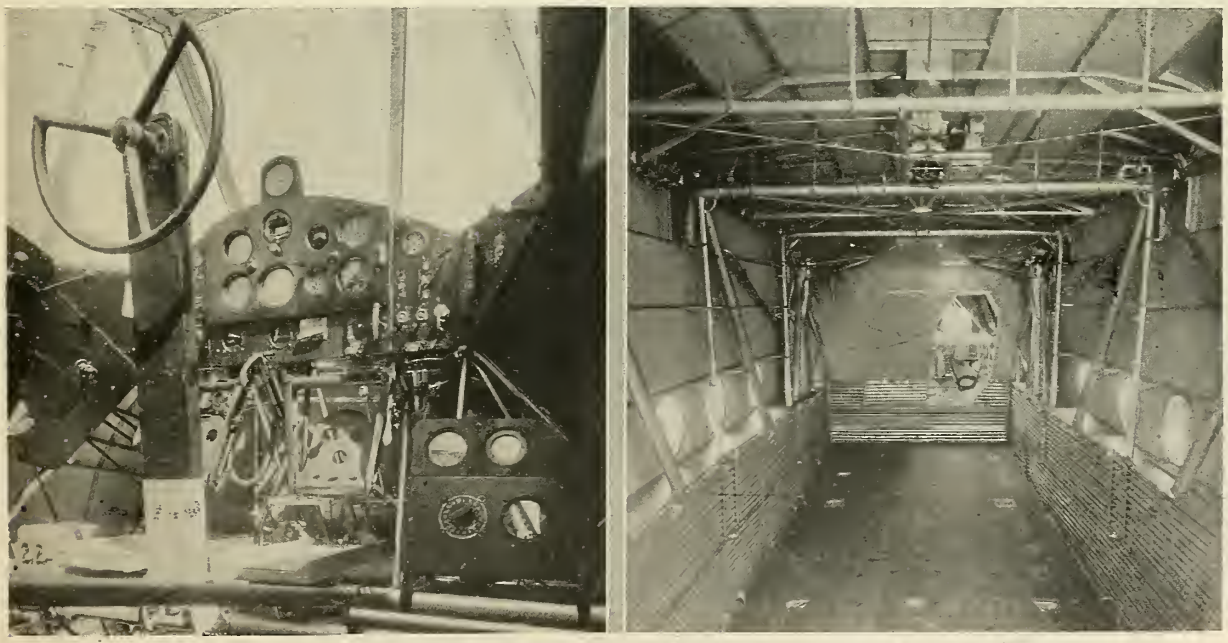
Scale drawings of the Fairchild XC-31 military cargo transport

Controls are operated by cables attached to the conventional rudder and brake pedals and Dep control mechanism in the pilot's cockpit. The power plant consists of a Wright Cyclone model R 1820-25, 750 h.p. engine driving a Hamilton Standard propeller of the three-bladed, controllable-pitch type.

Three type A2 Pyrene fire extinguishers are provided. Two flare racks containing M8 airway flares are located in the floor of the compartment behind the cargo cabin, and operated by cables leading to the standard type A3 release handles in the cockpit.

Specifications

Wing span	84 feet
Length overall	55 feet
Height overall	15 feet 10 inches
Weight empty	7322 pounds
Useful load	5678 pounds
Gross weight	13,000 pounds
Top speed	167 miles per hour
Cruising speed	140 miles per hour
Landing speed (with full load)	52 m.p.h.
Cruising range (full load)	750 miles



Pilot's cabin of the Fairchild military transport and an interior view showing fittings for various installations

Radio Equipment for Aircraft

GARY S. EVANS

Air Associates, Inc.

● The value of immediate meteorological information can best be determined by the difference between the completion of a scheduled flight and a forced landing, due to adverse weather. Advanced information as to the visibility and expected changes in weather can be, and has been, best handled by the transmission of meteorological reports at the time the observation is made, rather than awaiting the arrival of a transport ship at a terminal. Radio provides the pilot with advanced information shortly after the observation is taken by the meteorological observer, thus eliminating delay and permitting rapid decisions to be safely made. The radio telephone system built for the airlines was devised to provide this service.

For five years development has progressed, each year bringing advances in technique and in the results expected from the transmission of messages from the airplane to the ground and vice versa. The first radiotelephone equipment developed for airplanes was by no means light in weight, the average two-way installation being in the neighborhood of 270 pounds and in some cases exceeding 300 pounds. However, this was to be expected, as little knowledge was available to the design engineers as to just what could be expected of certain component parts of the equipment. Exactly how light it could be made and still resist the vibration in aircraft of this period was a problem which required careful consideration.

The past four years have shown a marked tendency toward lightening equipment and increasing the efficiency of the radio unit. With this in mind, RCA Victor's engineers set out to develop a radiotelephone system which would deliver sufficient antenna power to establish successful communication and at the same time remain within reason with respect to weight. To this end a transmitter was developed and it is now possible for the pilot to have a reliable communication system and at the same time not be penalized in weight and cost. The present aircraft transmitter complete with tubes and microphone weighs slightly in excess of 35 pounds, and in keeping with the general type of construction of present-day pleasure and private airplanes, it is only 9⅞ inches high, 10⅝ inches wide and 16⅜ inches long.

Special attention has been given throughout the design to the need for quick inspection and servicing of the equipment. The base consists of two parts, one of which is permanently fastened in the aircraft, the other fastened to the base by a cowl stud and two snap fasteners. This permits rapid removal of the complete transmitter for replacement and inspection. Snap fasteners on the transmitter panel permit the entire transmitter to be removed rapidly from its case and all parts of the transmitter are then readily inspected and serviced.

The dynamotor power supply, mounted as it is in its own shock-mounted sub base to the transmitter chassis, is readily removable for servicing, it being only necessary to remove four wing nuts and two come-apart electrical connectors. Transmitter controls are concentrated on one panel fastened to the transmitter chassis, permitting bench operation for testing and service work. The entire transmitter equipment, small and extremely light, is easily installed requiring only the fastening down of the bed plate to the aircraft and the connection of a 12-volt power supply, the antenna and ground.

The inter-connecting electrical cable, which is always heavy and bulky, is thus eliminated and the transmitter gear is concentrated in one location. This transmitter was designed primarily for installation within easy reach of the pilot or the operator. The unit can be adapted to remote installation by inclusion of one electrical cable to control switching of electrical circuits and communication channel and switches of remote control points and wire push-pull control for frequency changing switch.

Remote control panel and receiver volume control installation

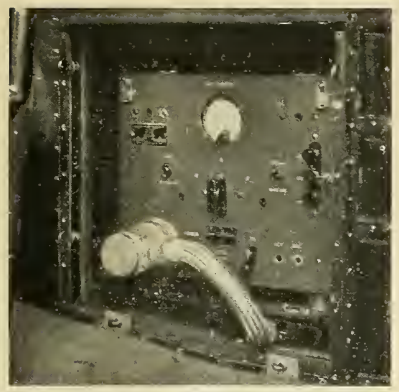
The transmitter derives its power from the 12-volt aircraft storage battery and draws its primary power of 25 amperes only when the microphone is spoken into or if the telegraph key is pressed.

Three types of transmission are available: (a) continuous wave telegraph; (b) tone modulated telegraph; (c) telephone. Any one may be quickly selected by controls located on the front of the transmitter. A key with plug and cord is provided for telegraphic operation while a hand microphone is provided for telephone operation.

Three pretune frequencies are provided. A special combination of coils and condensers in a specially arranged assembly with drums switching the control knob projects through the front panel, permit immediate selection of any one of the three frequencies without further adjustment by the operator or pilot. This eliminates the possibility of a false adjustment or forgetting to adjust a component part of the transmitter to establish a certain frequency. Any three frequencies between 2 and 6 5/10 megacycles (46.2 to 150 meters) can be chosen and the transmitter fixed-tuned to these frequencies. Then it is only necessary for the operator to move the frequency control knob on the front of the transmitter to shift from day to night frequency or to the standard 3105 KC, the standard for use in communication with the Department of Commerce stations.

This design of transmitter will deliver 25 watts to the conventional aircraft antenna when any of the three methods of communication are used. The master oscillator power amplifier circuit is employed, permitting maximum frequency stabilty when carefully installed and operated. Operation on any one of the three frequencies, as before mentioned, is pos-

Richfield Oil Company's Northrop which is equipped with the new RCA radio unit



Transmitter in its compartment underneath a couch in the cabin

sible and regulation is well within the limits imposed by the Federal Radio Commission's regulations and the even more imposing regulations of present day aviation communications.

Three forms of signalling were incorporated in this transmitter to permit the operator to select the form which permits most satisfactory communication under existing conditions. This assures more perfect communication in all weather conditions than can be provided with a single form of a transmitter.

Years of operation of transmitter equipment on transport aircraft have proven that this latest feature is indispensable in the maintenance of reliable and consistent communication. A CW signal will carry through heavy static conditions when telephonic communication fails and it was for this reason that this type of communication has been incorporated in the design of this transmitter.

Tubes and Power Switching

The tube complement consists of type 10 tubes and type 41 tubes, a master oscillator of the 2-10 type, a speech amplifier of the 2-10 type tubes; two class B 841 modulators and two 2-10 type tubes used as power amplifiers. On modulated CW the tone modulation is supplied by the audio system, which is suitably switched to provide tone. On telephone, modulated power is supplied by two RCA 841 tubes in class B, driven by an RCA type 10 tube, used as a class A speech amplifier. The speech characteristic of this transmitter with the single button special type aircraft transmitter is nearly flat from 200 to 3,000 cycles.

Voltage readings are taken from three jacks, installed so as to read the filament voltage, the filament current and the total plate current. Two jacks are provided, one for microphone and antenna relay control and the other for a transmitter key. Switching from CW position to the ICW position lights the filament of this tone oscillator, which is of the 10 type tube and supplies approximately a 400-cycle tone to the carrier. A suitable filter system and voltage divider are provided in the power supply to accommodate two aircraft receivers. The power switching on this transmitter consists of two switches, one of which controls the filament of the transmitter tubes and the other supplying +12 volts to the dynamotor. The arrangement whereby the plate supply for the receivers can be obtained from the transmitting dynamotor may possibly meet with some objection until it is considered that the transmitter dynamotor load is carried substantially by the charging generator on the airplane engine. Under operating load conditions, the storage battery is floated across the charging line, the current being supplied by the generator and carefully regulated by the regulation control box. Installation difficulties in this type of transmitter are nominal.

In order to establish a remote control system it is necessary to run only one five-wire cable from the transmitter to the remote control unit.

The new Model RCA Victor aircraft receiver, type AVR-2 was installed for use in conjunction with the transmitter. A complete description of this model was published in the new equipment section of the March, 1934, issue of Aero Digest.

Recent Aeronautical Patents

The following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W. Washington, D. C.

Means for indicating rate and direction of movement; also sound locator and computer of aircraft. Frank R. House, Baldwin Harbor, N. Y., assignor to Sperry Gyroscope Co. (1,976,726 and 1,976,727)

Variable-pitch propeller mechanism. John R. Zipay, Pittsburgh, Pa. (1,977,031)

Aircraft propeller. William H. Lyman, Denver, Colo. (1,977,072)

Controllable-pitch propeller hub. Fred J. Martens and Clinton O. Thompson, Milwaukee, Wis. (1,977,077)

Aerial navigation signaling system. Alexander McL. Nicolson, New York, N. Y., assignor to Communication Patents, Inc. (1,977,198)

Aircraft. Donald Mackenzie, Los Angeles, Calif. (1,977,392)

Magnetic steering indicator. Roland F. Beers, Belmont, Mass., assignor to Submarine Signal Co. (1,977,615)

Airplane construction. Henry A. Berliner, Washington, D.C., assignor to Berliner-Joyce Aircraft Corp., Dundalk, Md. (1,977,616)

Apparatus adapted for lighting the ground and for aircraft signals. Marie C. M. Exelmans, Neuilly - sur - Seine, France, assignor to Holophane Co., New York, N. Y. (1,977,673)

Propeller. Roger K. Lee, Highland Park, Mich., and Edward F. Zaparka, Baltimore, Md. (1,977,681)

Torque compensator for rotating wing systems. Russell R. Hays, Wellsville, Kans. (1,977,724)

Ground speed and drift indicator. Harold Gatty, Ocean Park, Calif. (1,977,762)

Aircraft having pivotally- and rotatively-mounted sustaining blades. Harold F. Pitcairn, Bryn Athyn, Pa., assignor to Autogiro Co. (1,977,834)

Flying machine. Frank J. Baume, Los Angeles, Calif. (1,977,843)

Magnetic compass. Wladimir A. Reichel, Philadelphia, Pa., assignor to Aircraft Control Corp. (1,977,954)

Spinner structure for aircraft. Frank W. Caldwell, Hartford, Conn., and Carl F. Rauen, Detroit, Mich. (1,978,039)

Ball gyroscopic compass. Reginald E. Gillmore, New York, N. Y. (1,978,425)

Airplane stabilizer structure. Roscoe L. Markey and Harold Sadler, Dundalk, Md., assignors to General Aviation Mfg. Corp. (1,978,640)

Airplane control. David Gregg, Caldwell, and Wesley L. Smith, Cranford, N. J., assignors to Eclipse Aviation Corp. (1,978,863)

Disappearing carriage for aircraft. Henry C. A. Potez, Meaulte, France. (1,979,011)

Transverse driven body. Julius F. Ziegler, Vienna, Austria. (1,979,184)

Airplane having a variable lifting surface. Jacques Gerin, Boulogne-sur-Seine, France. (1,979,194)

Aircraft altitude determination system. Albert H. Taylor, Leo C. Young, and Lawrence A. Hyland, Washington, D.C. (1,979,297)

Airplane wing. Serge Trey and William Howard, College Point, N. Y. (1,979,298)

Airplane gasoline gauge. Horace H. Raymond, Berlin, Conn., assignor to Stanley Works. (1,979,705)

Aircraft. Evan P. Savidge, Los Angeles, Calif. (1,980,002)

Boundry layer controls for airfoils. Clifford C. Jones, Washington, D.C. (1,980,139 and 1,980,140)

Welding Developments

• MANUFACTURERS OF welding equipment and welding accessories are keeping abreast of developments in the art of welding by producing devices which speed up work, facilitate production and assure better results.

The Lincoln Electric Co., of Cleveland, for instance, has just announced a new, small, motor generator unit to satisfy the demands for an arc welder for thin sheets, plates and shapes and metal-working. In addition, a new synchronous-motor-operated timer which automatically and accurately times the power supply to resistance welders by controlling the contactor on the welder, is available from the General Electric Co.

The Lincoln welder, type SA 75, can be supplied for use on any alternating current power line including 110-volt circuit, and will deliver as low as 20 amp. at the arc without auxiliary devices. It is of AC motor-driven type employing a 25-volt arc within a 20-100 amp. current range. The generator is a single operator, variable voltage type with 75 amp. N.E.M.A. rating; the motor is the Linc Weld, 3-h.p., squirrel cage induction type for across-the-line starting, while the welder is supplied for alternating current 110 and 550 or special voltages of 3, 2 or 1 phase, 60 and 50 cycles, as desired. A dual control provides easy welding by allowing independent adjustment of open circuit voltage and welding current.

The GE CR7933 timer consists of a 60 r.p.m. synchronous motor operating a set of contacts which control the opening and closing of a welding contactor. In normal operation, with the welder idle, power is applied to the reverse winding of the timer motor, causing rotation until a projection on the motor shaft closes the contact, hits the stop and stalls the motor. This contact is in series with the line contactor operating coil and the initiating switch (control) on the welder.

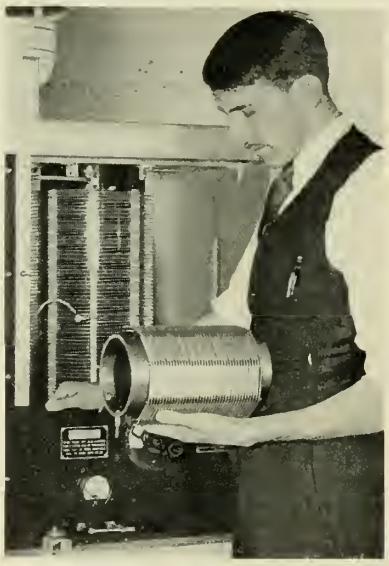
In making a weld, the initiating switch is closed, energizing the contactor coil, closing the contactor and applying power to the welder. Simultaneously, power is shifted to the forward winding of the timer synchronous motor. During forward rotation of the motor, the timer contact is held closed by a magnet until a second projection on the motor shaft opens it and thereby opens the line contactor circuit and removes power from the welder. The duration of current flow at the weld depends on the setting of the timer and has no relation to the period the initiating switch is closed. Opening the latter switch allows the timer to reset automatically for the next weld. Resetting does not take place, however, until the completion of a weld, because an interlock on the welder contactor holds the circuit for the duration of the weld.

A graduated disk associated with the second projection on the timer motor shaft sets the timer for a given duration of welding current. A range of from 1/12 to 5/6 per sec. in one-cycle steps (60-cycle supply) is thus available, welding times up to 5 seconds, being obtained by using a lower-speed timer motor.

Improved Aircraft Radio Beacons

• NEW WESTINGHOUSE antenna tuning units to improve present radio beacon service, and to prevent skyward radiation of signals are being manufactured for installation on the Department of Commerce airways at the Chicopee Falls, Mass., works of the Westinghouse company.

When using older types of antennas for the radio beacon stations, a considerable quantity of the radiated energy was



The Westinghouse tuning unit for beacons

directed skywards at night, and on being reflected from the sky, caused interference with the original wave traveling along the ground, making on-course flight at times uncertain. By installing four vertical antennas for each station, it has been possible to largely eliminate the amount of signals radiated skywards.

Each vertical antenna requires at its base, a tuning unit which is enclosed in a sheet aluminum and ventilated house which prevents water and other foreign matter from getting inside to cause short circuits.

Flexible Insulation

• A FOUR-FEATURE insulation has just been announced by the Wire Division of United States Rubber Products, Inc., New York, N. Y.

Called Laytex, the material is derived directly from latex, the milk of the rubber tree and through a patented process, proteins, sugars and water solubles are removed. A conductor is then run through a series of liquid baths, and during each bath a film of insulation, which is converted from liquid to solid, is taken on the conductor. The liquid is solidified on any given section of the conductor before that section is in physical contact with any mechanical support, thus avoiding usual mechanical defects, and assuring perfect centering and uniform wall thickness.

Flexibility is evidenced by elongation tests which show a 750% stretch; tensile strength is 5,000 lbs. per square inch; a high dielectric constant is evolved from the purity and uniformity of Laytex, while its insulation resistance constant is more than twice as high as that of the best grade rubber compound required by the A.S.T.M. specifications. Because of the above qualities, thinner walls, superior in physical and electrical characteristics, are possible, thus saving space and weight.

Scrap Metal Baling Press

• A RECENT development of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is a box-type scrap metal baling press, incorporating the H-P-M Hydro-Power principle of operation.

The baling press, completely self-contained with its motor driven hydro-power unit mounted on the press at one end, consists of a box built up of massive ribbed steel castings to take the loose scrap metal. It is closed by a sliding door, actuated by a hydraulic cylinder.

Pressure is applied to the scrap first from the end, and then from the side by platens moving into the box operated by hydraulic rams. Pressure application is controlled through 3 lever-actuated valves.

Two pumps, each of the rotary, high-speed, oil pressure type, build up the pressure. The first delivers a large volume of oil at medium pressure; the second, a new variable delivery radial type, builds pressure up to maximum, while a control automatically regulates the pump's pressure and output volume.

Compactness, smooth action, speed of operation and ease of control are among the features claimed for this new baler.

Refining Aviation Oil

• THE CLEAROSOL Process for refining motor oils has been adapted for aviation oils by the Socony - Vacuum Corp., and it is now possible to market a product which it is claimed will greatly reduce wear of moving parts in aircraft engines. The new process also insures freedom from ring gumming, excessive carbon deposits and sludge formation.

The Clearosol Process effects a purely physical separation of the paraffinic hydrocarbons from the non-paraffinic compounds and undesirable asphaltic materials. The separation is obtained by mixing the lubricating oil stocks with two solvents.

The valuable paraffinic compounds dissolve in one solvent and the undesirable elements dissolve in the other. Due to the difference in specific gravity, these two resulting solutions are easily separated.

Constant Speed Propeller

• A NEW-TYPE propeller, which removes the two-pitch limitation of the controllable-pitch propeller and automatically selects the optimum position for every flight condition has been developed by the Hamilton Standard Propeller Co., E. Hartford, Conn.

Called the constant speed propeller, the new device consists essentially of a governor unit attached to the machine gun synchronizer shaft at the rear of the engine. Changes in the engine r.p.m. are directly and automatically transmitted to the propeller blade adjusting mechanism, at all times, through the governor control to provide an infinite number of pitch selections and hold the engine revolutions to whatever operating speed the pilot selects. Any tendency of the engine to either increase or decrease its speed, due to load variations, is immediately counteracted by the automatic changing of the blade pitch in the direction necessary to bring the engine speed back to the selected operating speed.

At the take-off, the engine-speed control is set at the maximum allowable revolutions, the pilot opening his throttle until the maximum permissible manifold pressure is reached. The automatic feature holds the engine speed to the selected full-power r.p.m., regardless of any change in forward speed of the plane.

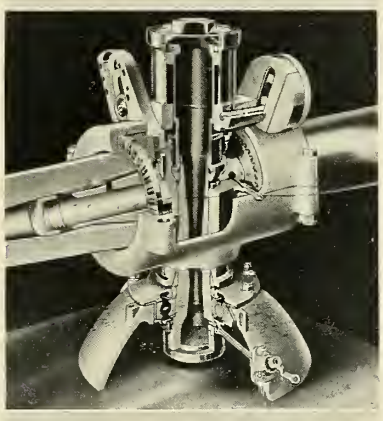
When the cruising altitude is reached, the pilot reduces the setting of the engine-speed control to cruising r.p.m., and adjusts his throttle accordingly. If the altitude is changed, the only adjustment required is a change in throttle setting to obtain the manifold pressure for the new altitude.

In landing, the throttle is nearly closed, but the engine continues to turn at almost full speed because the blade pitch angles have been continuously reduced by the automatic control. Immediate full-engine-power is then available if necessary.

Flight tests have been made with planes powered with geared or direct drive engines from 300 to 725 h.p., using two- and three-bladed props.

The precision of the control is noted during the normal cruising conditions, and the control readily responds to sudden changes in the plane's attitude or to other operating-condition changes such as sudden opening or closing of the throttle.

Engine synchronization at all times and reduction of vibration are other advantages derived from the new device. The unit in its present form is simple and rugged, about the size of a carburetor, adding four or five pounds to the propeller-engine weight and can be installed to existing controllable pitch two-bladed Hamilton Standard props as a field modification. The accompanying illustration shows in the lower right corner the actuating lever which is attached to the automatic governor.



Cut-away view of the constant speed Hamilton Standard propeller

Steam Heating Air Transports

• A STEAM-HEATING plant, thermostatically controlled to maintain a constant temperature of 70° F., in the passenger cabins of airliners is the latest achievement of aeronautical engineers.

One of these new units has been installed in the TWA Douglas twin-engined transport flying the coast-to-coast service. The steam heater is a miniature boiler in which water is heated by the engine exhaust. The thermostatic control maintains a constant temperature of 70° in the 14-passenger cabin even though the outside temperature falls to —20°.

Besides the greater comfort of a constant cabin temperature, the steam heater eliminates any possibility of noxious exhaust gases entering the cabin.

Brazing Flux

• DEVELOPED TO speed and improve brazing operations on ferrous or non-ferrous metals, Handy Flux is being marketed by Handy & Harman, New York, N. Y.

A low melting point, greater solvent action and strong and dependable joints are claimed for the product. Made in paste form, the flux works over a wide temperature range, spreading rapidly over the work and avoiding bare spots or blowing away of the flux by the force of the blow torch. The manufacturers recommend its use for a wide variety of metal and other ferrous and non-ferrous metals and alloys.

High-Speed Milling Head

• EX-CELL-O Aircraft & Tool Corp., Detroit, Mich., has a new high-speed milling head adapted for use on horizontal boring mills and milling machines, and providing the higher speed-range required for the smaller sizes of end mills and drills.

The driving shank of the head is furnished with a No. 5 Morse taper which makes it adaptable for use in all boring mills and milling machine spindles. The spindle in the high-speed head is furnished with a No. 4 Morse taper which represents the most popular size for end mills, drills, chucks, etc.

The step-up ratio of the head is 4:1 over the spindle speed of the machine. The unit is designed for a top speed of 1500 r.p.m., on the high-speed milling spindle and has a maximum capacity of 1″ diameter end mills and 1″ diameter drills in steel.

The body of the milling head and the driving shank are of one-piece construction, the high-speed spindle being mounted in the body of the milling head by precision-tapered roller bearings. Planet idler gears are mounted by roller bearings on hardened pins securely anchored on both sides of the idler gears. Light-grade transmission grease is used to provide adequate lubrication.

A boss is on the outside diameter of the milling head, supporting a torque bar which engages with another bar mounted on the column of the machine parallel to the axis of the machine spindle. The torque bar attached to the head and the clamp for mounting the parallel bar are furnished with the head. The parallel bar is provided by the customer to meet the requirements of the individual job.

A knockout pin for drifting the end mills and other tools from the high-speed spindle extends through the driving shank so that the tools can be removed without removing the milling head from the machine spindle.

Direct Control American Wingless Autogiros

● Differing radically from previous conventional autogiros, two new models, one an open cockpit type, the other a cabin job, have just been demonstrated to the aviation industry in the United States by Kellett Autogiro Corp., and Autogiro Company of America, respectively. In these models, wings, ailerons and elevators have been entirely eliminated and use of the rudder is optional with the pilot. Three-bladed, folding rotor systems have replaced the rigid, four-bladed units previously used.

Control is maintained through inclination of the entire rotor system, which is so mounted as to pivot on a universal axis in accordance with the conventional movements of the control stick. This new control system provides positive control of the craft at all times and under all conditions ranging from vertical descent and no forward speed to the maximum speed condition.

Pitcairn Autogiro

Direct control—a return to fundamentals in more ways than one as regards autogiro practice—made its initial appearance in this country when James G. Ray, vice-president of the Autogiro Company of America, demonstrated the first American machine of the type to the public at Washington on November 8.

Direct control means that the entire machine is controlled directly through its sustaining mechanism, or rotor, without the aid of ailerons, elevators, rudder or other surfaces subject to extreme changes in effectiveness with each change in forward speed. In the first American model a rudimentary rudder is used but will be dispensed with on instruction machines. The conventional rudder has proven unnecessary for ordinary flight within the entire speed range.

This speed range is now from 17 to 105 m.p.h. with the experimental machine which has been under development by the Autogiro Company of America since

Pitcairn autogiro in flight over Washington

April, 1933, giving a factual ratio of better than 6:1. Performance measurements have been made on days as nearly windless as possible, and corrected by averaging the results of flights both with and against the wind. As evidence of the low speed performance, a man can outrun the machine under ordinary conditions.

While bearing evidence of its experimental nature and history (the machine is in fact a mockup and has been several times altered in nearly all essentials), the performance of the experimental direct control 'giro shows more markedly different characteristics as compared with the other 'giros than was the case as between the first production autogiros and airplanes. Having eliminated the rudder, the factor of coordination between stick movement and rudder bar has disappeared from instruction, and "crossing controls" is eliminated. The control-differential between high and low speed conditions has been eliminated for all practical purposes.

The present two-place, side-by-side cabin autogiro indicates a general type such as might be developed to promote the use of aircraft by the general public. The details of construction are capable of refinement and the general arrangement does not necessarily represent the ultimate form.

In autogiros of the direct control type the control stick is the inverted or hanging type, being pivoted to the cabin roof in the center and easily accessible to either occupant. Push-pull rods connect the stick with the rotor mounting to effect control movements of the rotor hub, this arrangement giving a minimum number of joints.

When the autogiro is on the ground the control stick is moved to the forward position and secured there by a latch. The rotor is then at its low incidence, least affected by wind gusts. This position is also maintained while revving up preliminary to take-off, and when the rotor revolutions reach flight-speed, the stick is unlatched and the rotor clutch disengaged. Take-off is accomplished after a short run by pulling back on the stick in the usual manner.

From a structural point of view, the landing gear closely resembles orthodox type. The front wheels, however, are placed much further forward than has been the practice in airplane or previous autogiro construction so that a greater part of the weight is carried by the steerable tail wheel. The ground angle is also less than is usual in aircraft practice.

In a normal take-off the tail remains on the ground until the three wheels lift. This procedure does not penalize the take-off since, because with the fixed wing eliminated, it is not necessary to get the tail up to gain take-off speed (approximately 25 m.p.h.). Take-off is accomplished by increasing the rotor incidence without changing the fuselage attitude appreciably.

The low-speed characteristics and flying qualities of an autogiro of this type are adaptable to the needs of the amateur flyer. Most of the minimum forward speed can be eradicated before contact with the ground by increasing the incidence of the rotor, and the actual landing may be made with little or no forward speed.

Full control is available, even at zero forward speeds, since the rotor, which retains its lift regardless of forward speed, produces the control moments. Thus the effect of gusts may be adjusted, even when landing with no forward velocity. In flight the machine is easily controlled and maneuvered. Bungees are provided which may be adjusted for various conditions of loading and flight, so that the controls may be flown hands-off. Turns, climbs and other normal maneuvers may be practiced by a novice without danger of spins from improper handling, or of control failure from the older style control surfaces.

Blades are arranged to fold and since there are no fixed wings, the width of the storage space is determined by the span of the tail surfaces (7 ft. in the experimental machine). The blade folding

Side view of Pitcairn wingless two-place cabin autogiro with rotor blades folded

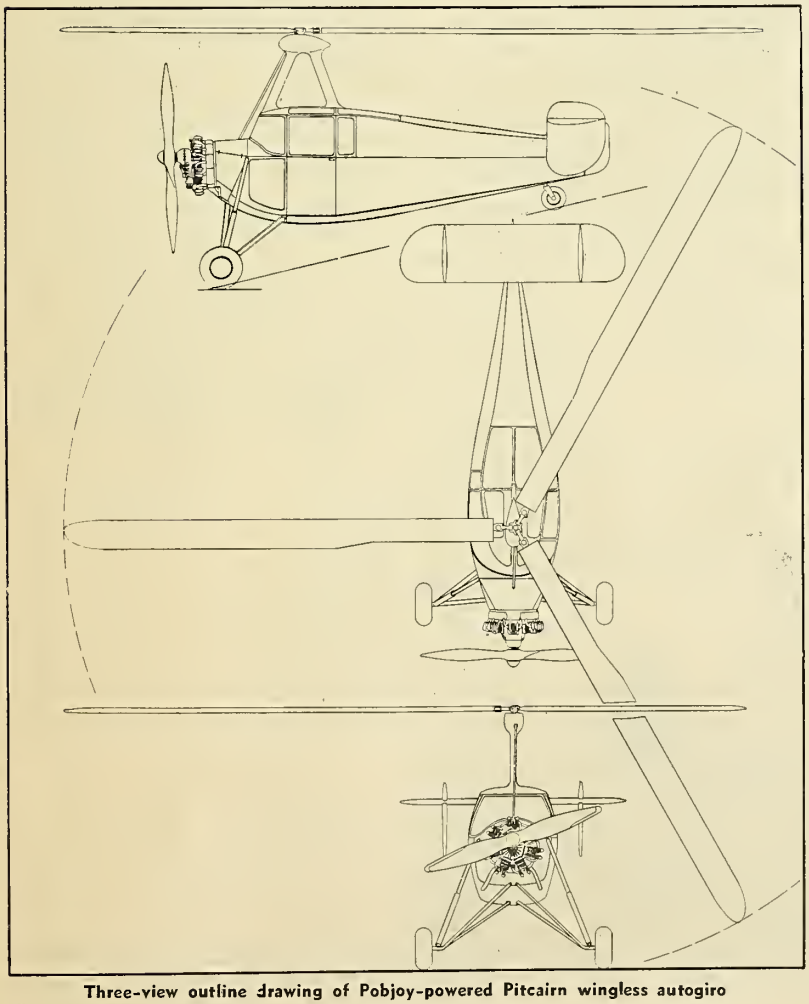
process is extremely simple, the rotor having but three blades, two are folded back alongside the third over the tail of the ship. The folding pivot is the same about which the blade is mounted for movement in the plan of rotation during flight. By removing a pin which normally acts as a stop to restrict the angular movement of the blade to a few degrees, the blade can be folded back. Because the main blade pivotal connection is not disturbed when folding the blades, nothing untoward can be caused by failing to properly replace the removable pin.

The absence of a fixed wing permits excellent vision in all directions. Transparent panels are provided in the lower forward sides of the cabin, as well as in the roof for vision upwards, downwards and to the rear. The fact that the engine is geared, with the propeller axis above the center of the engine, permits it to be placed lower in the fuselage while still giving adequate propeller clearance. Good forward vision results from this arrangement.

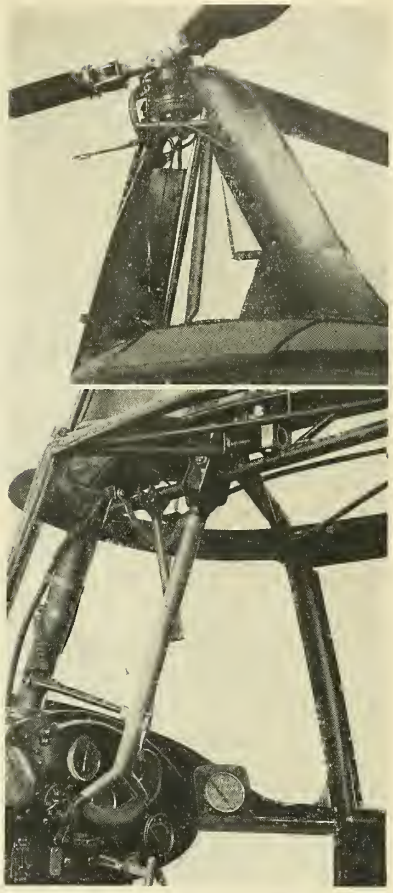
An additional advantage gained from the use of the geared propeller is that the fuselage may be somewhat lowered. Ease of access to the occupant's compartment is thus provided, the absence of fixed wings or struts adding materially to this feature. The low center of gravity naturally gives good ground stability.

The new-type autogiro does not depend upon forward speed for either stability or control, since the rotor retains dynamic qualities giving sustention, stability and control even with the body of the machine settling vertically and without power. Engine failure should not seriously menace the safety of the occupants, for a landing is possible in almost any spot large enough to accommodate the machine. The same qualities which produce the autogiro's landing characteristics also work to insure safety during flight.

The blades of an autogiro are highly loaded. Lift is retained at low speed since the blade-velocity is not reduced appreciably when forward speed decreases. Thus the autogiro has exceptionally desirable landing qualities and at the same time is excellent riding, even in bumpy air. Moreover to obtain these characteristics does not require the operation of additional controls by the operator. They are inherently combined in the autogiro and greatly enhanced in the dual-control type.



Three-view outline drawing of Pobjoy-powered Pitcairn wingless autogiro



Top: Rotor hub system in the Pitcairn autogiro. Below: Hanging-type control stick and instrument panel

The empty weight of this autogiro is about 600 lbs. with a gross weight of approximately 1,140 lbs. The top speed is 105 m.p.h., with cruising speed at 90 m.p.h. at substantially reduced throttle. With greater attention to streamlining, the top speed will be improved somewhat. With 17 gallons of fuel, the range is approximately 350 miles. Diameter of the rotor is 32 ft.

Kellett KD-1

The Kellett KD-1 direct control autogiro is a two-place, open tandem-cockpit machine powered by a Jacobs L4 engine of 225 h.p.

Alloy steel and alloy steel tubing and fittings throughout feature construction of the fuselage. The pilot and passenger seats are shaped and located for maximum comfort and upholstering is provided around the cockpit for appearance, comfort, and durability. The fuselage

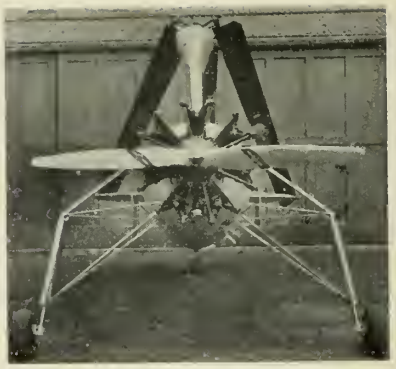
cross-section and cockpit cowling is designed to give maximum visibility.

The 9 ft. 6 in. landing gear is of the double-fixed tripod type with the axle telescoping in the shock strut, providing the nearly vertical wheel travel necessary for autogiro landings. The wheels, which move slightly inward as they travel upward relative to the autogiro (to better absorb the shocks of a side landing), are mounted on tapered roller bearings for long life and proper alignment of the brake drum relative to the brake shoes.

Mounted in an Army-type steerable tail-wheel fork connected to the rudder pedals, the full-swiveling tail wheel provides positive steering. The holding and release mechanism is purely automatic, disconnecting itself when necessary for handling on the ground and connecting itself to the rudder control when taxying. Extra long travel of the tail wheel shock strut provides good shock absorbing qualities when landing and easier riding qualities when taxying.

The tail group of the direct control autogiro does not include an elevator control, this feature being unnecessary because of the control provided in the rotor, and vertical surfaces are of ample area to give directional stability. The rudder, though comparatively small, is sufficient to take care of changes in balance due to engine torque and is not used during normal flying maneuvers.

The rotor blades are attached to a hub which rotates freely on a short spindle mounted so that it can be tilted sideways or fore and aft by the control stick in the pilot's cockpit. This direct control mechanism furnishes positive longitudinal and lateral control and has eliminated the necessity for the fixed wing with its ailerons for lateral control.



Kellett autogiro with rotor folded

Rotor blades are built around high tensile-strength, brightly polished alloy steel tubes. The inner ends of the spars contain hydraulic dampers for controlling the position of the blades about the vertical hinge pins, the dampers being so constructed that the oil is kept in the sealed bottom of the cylinders by centrifugal force, thus eliminating packing to retain the oil.

Extension blocks which connect the blades to the hub act as universal blocks, allowing the blades to flap and oscillate freely in the needle bearings, and include cams and blade stops used to self-center the blades and provide positive stops to limit their motion.

The hub, machined from an alloy steel forging, is mounted on a spindle by a thrust and two radial ball bearings and the hub-controlling trunion bearings are of the non-friction needle-type providing smooth operation.

Mounting of the rotor system is at the upper end of a large streamlined chrome molybdenum steel tube pylon strut, the tension loads going to the lower end of the strut to minimize the use of welded fittings or holes drilled at the point of maximum bending stress.

A rotor starter unit is mounted aft of the engine, including a pair of bevel gears and a clutch, with ball bearings used throughout. The clutch, which follows automobile practice using a limiting torque clutch in combination with a cone clutch, is controlled by a conveniently located handle in the cockpit.

The provision for folding back the rotor blades over the tail surfaces while the machine is on the ground, brings the overall dimensions of this giro to 26 ft. × 10 ft. 3 in. × 10 ft. 4 in.

Control bearings throughout the control system are of either needle bearings or ball bearings. Bungee adjustments are provided to give lateral and longitudinal balance for any load condition at any speed. Control movements and forces of rudder and stick are coordinated and rotor starter and brake controls are arranged on the metal instrument board with the engine controls and instruments.

The Jacobs engine is a special model designed for autogiro use to improve the installation of the rotor starter and Heywood pump. The engine mounting is cushioned and the Curtiss-Reed fixed-pitch propeller is included as standard equipment as is a Heywood compressed-air starter.

Fuel tanks for 50 gallons are of welded aluminum mounted on the sides of the fuselage outside the fuselage structure and held in place with felt-padded steel straps. The 4-gallon oil tank, of similar construction to the fuel tanks, is mounted inside the engine compartment.

Specifications (with blades folded) and performance data (at sea level) of the Kellett KD-1 direct control autogiro are as follows:

Specifications

Length	25 feet 10 inches
Width	10 feet 4 inches
Height	10 feet 3 inches
Rotor diameter	40 feet
Wheel tread	9 feet 6 inches
Horizontal tail area	22 square feet
Vertical tail area	12 square feet
Empty weight	1352 pounds
Fuel	300 pounds
Oil	30 pounds
Loaded weight	2052 pounds

Performance

High speed	125 miles per hour
Cruising speed	103 miles per hour
Minimum horizontal speed	16 m.p.h.
Rate of climb	100 feet per minute
Cruising range	361 miles
Cruising endurance	3 hours 30 minutes
Take-off run	60 feet
Landing run	Zero

Kellett's open-cockpit version of the wingless autogiro with 225 h.p. Jacobs engine

Name_____

Address_____

City_____

State_____

Enter for the above, Gift Subscription No.....

Name_____

Address_____

City_____

State_____

Enter for the above, Gift Subscription No.....

Name_____

Address_____

City_____

State_____

Enter for the above, Gift Subscription No.....

Name_____

Address_____

City_____

State_____

Enter for the above, Gift Subscription No.....

Enclosed is my ☐ check ☐ money order in the amount of $....., for the Gift Subscriptions listed above. Please send Gift Announcement Cards; and mail the magazines in time for Christmas delivery.

DONOR:

A CHRISTMAS GIFT OF GOOD JUDGMENT

THE selection of appropriate and individual Christmas Gifts is something of an art. A difficult task at times, it is a simple matter—on the other hand—when you know definitely in what a person is particularly interested. For example, those of your friends who are studying or who are engaged in aeronautical work will appreciate a subscription to AERO DIGEST. You read it yourself and know just how much you get out of it every month. 🎄🎄 Or if any of your other friends to whom you usually make Christmas Gifts are interested in sport flying, then a subscription to THE SPORTSMAN PILOT (only magazine devoted 100% to private flying) is the logical choice. 🎄🎄 A third suggestion is the Combination Subscription—one year of AERO DIGEST and one year of THE SPORTSMAN PILOT. 🎄🎄 To each person for whom you purchase a Gift Subscription we will send an attractive card announcing your Gift, together with the first copy of the magazine on the new subscription. Christmas delivery guaranteed.

AERO DIGEST

515 Madison Avenue, New York, N. Y.

If you are not certain whether or not they already subscribe to either of these magazines, drop us a note and we will check our files and advise you promptly.

RATES

AERO DIGEST OR THE SPORTSMAN PILOT

	U.S.	Canada	Foreign
One year	$3	$4	$5
Two years	$5	$7	$9

COMBINATION SUBSCRIPTION: One year of AERO DIGEST and one year of THE SPORTSMAN PILOT—$5 in the United States, $7.25 in Canada, $8 in other countries.

When filling out your Christmas Gift orders be sure to number each subscription as follows: No. 1 (AERO DIGEST, 2 years); or No. 2 (AERO DIGEST, 1 year); or No. 3 (THE SPORTSMAN PILOT, 2 years); or No. 4 (THE SPORTSMAN PILOT, 1 year); or No. 5 (Combination Subscription).

Please print your own name in the space labeled "Donor" at the bottom of the order blank column. Use the style you want us to follow on the Gift Announcement Cards.

Troy Airport Improved

PREPARATIONS ARE under way for the immediate construction of an administration building, a hangar and the installation of lighting facilities at the Troy, N. Y., airport.

The administration building will be a one-story structure of brick and steel, measuring 30 × 64 feet. Directly opposite the intersection of the runways, it will house the administration offices, waiting room, radio room, Department of Commerce office, Weather Bureau and other facilities.

The hangar will parallel this building and will measure 90 × 120 feet with a 20-foot lean-to extending the length of the structure which will allow housing four large transport and 10 small private planes. Space will be set aside for additional hangars.

The lighting installation will include government-approved features, among which are runway intersection lights, obstruction and boundary lights, approach lights and a beacon and code flasher. In addition, there will be two ceiling projectors and a lighted wind indicator.

Two New Companies Operating

NEW ADDITIONS to the list of fixed base operators in the United States include companies in Ohio and South Dakota.

The Watertown Airways, Watertown, S. D., has been incorporated by George L. Jackson, Clyde Ice and Glenn Davey with a capitalization of $25,000, while the Canton (Ohio) Air Transport, Inc., has been formed with a similar capitalization by Harry S. Renkert, Jr., Daniel Q. Gennett and A. H. D'Aurora.

Lima Airport Dedicated

THE MUNICIPAL airport at Lima, Ohio, was dedicated with an impressive air show which featured the acrobatic flying of Lieut. Joe Jacobson, Gordon P. Mougey, Capt. Lewis A. Yancey and Lieut. J. C. Mackey.

Delayed parachute jumps by Taylor Mast were also featured on the program. More than 25,000 spectators witnessed the ceremonies. Speakers included Theodore Tangeman, Ohio Secretary of Commerce, Congressman Frank Kloeb, Mayor Allen L Metheany, and Major Fred L. Smith, director of Ohio aeronautics. Bill Smith was at the "mike."

TULSA SHOWS OPERATING PROFIT OF $4,165

NET OPERATING profit of the Tulsa, Okla., municipal airport for the year ending June 30, 1934, was $4,165.87, according to O. W. Duncan, airport auditor. Land owned by the airport is valued at $239,345.34 and $42,232.40 has been spent on grading and improving it; $5,739.02 for storm sewers, $79,493.22 for roads and runways and $125,988.81 for buildings.

Vermilya-Huffman Expand

THE FLYING service of the Vermilya-Huffman company at Lunken Field, Cincinnati, Ohio, has been expanded through the opening of a field at San Benito, Tex.

Creation of this field for general flying purposes and particularly charter work, caused the company to enlarge its capital to 400 shares of no par value stock. Incorporators are Walter J. Friedlander, C. I. Friedlander, Wright Vermilya, Jr., Stanley C. Huffman and Hermann A. Bayless.

Mississippi Airport Dedicated

WITH A crowd estimated at 8000 attending, Hattiesburg, Miss., dedicated its newest airport, Sky Harbor, with a program of stunts, acrobatic flying, parachute jumps and special aerial events. The airport was built and put into operation by James Daniels.

Among those participating in the dedicatory exercises were Max Holifield, Charles Gilly, John Beaumont, and the Fordyce Brothers.

It is expected that work will soon get under way on the construction of a hangar for the new field. This is the second field in the city, the other field being municipally owned.

Caterpillar 75 and LeTourneau Carry-all leveling site for the Wenatchee, Wash., airport

Cumberland Field Nears Completion

THE MUNICIPAL airport at Cumberland, Md., is rapidly nearing completion. Adequate landing and take-off space for any plane is now available and when finally completed, the field will have two runways, one, 4000 by 400 feet, extending East-West and the other, 3200 by 300 feet, running Northwest-Southeast.

The airport is a short distance from the city and is marked with boundary markers and the standard 100-foot circle at the intersection of the runways. Gas, oil, rental and service are available.

Idaho To Improve Airports

APPROXIMATELY $85,000 will be spent to improve eight of Idaho's 73 airports within the next few months, the funds coming from the FERA. The projects are at Burley, Boise, Coeur D'Alene, Downey, Kellogg, Sandpoint, Soda Springs and Victor.

The airports at Coeur D'Alene and Kellogg are to be lighted.

New Lighting System Completed

FINISHING TOUCHES have been placed on the extensive lighting system at the Pierce County Municipal Airport, Tacoma, Wash. There are about 25 miles of heavy electric cable laid underground, carrying sufficient current for the illumination of the field, whose lights exceed one million lumen.

The illumination system has been developed by Commissioner Lester Kelly and is being studied by many airport managers in the west. The entire system embraces beacon, primary and secondary floodlights, boundary lights, green traffic lights, red signals and other illumination. Some of the novel lighting effects include the special attention to night landings, and the training of special lights into the path of the arriving plane.

Michigan Airport Work Progresses

DURING THE past summer much productive work was done in improving existing airports in Michigan and work on new airports started under the CWA program last winter continued. This work was carried on under the Work Division of the FERA with the cooperation of the County Road Commissions and local departments of Public Works. All work is being done under the general supervision of the State Department of Aeronautics.

Some funds were made available early in the summer to purchase materials and pay equipment rentals necessary to complete all airport projects. These funds have now been nearly allocated and there is assurance that all airport projects now under construction will be completed. Several of the larger projects, however, may not be completed to the extent originally intended.

Air Shows at Lambert Field

A SERIES of air shows to interest the public in air travel are being held each Sunday at the Lambert-St. Louis Municipal Airport. The project is sponsored by the activities' committee of the Lambert-St. Louis Airport Association, and the entertainment will be supplied by a different member each Sunday. The final program will be paid for out of a fund raised by a pro-rata assessment based on the number of seats in planes owned by the association members.

Scranton Airport Rebuilt

THE AIRPORT at Scranton, Pa., has been rebuilt with the aid of CWA funds. This field is lighted, provides twenty-four hour service and is a two-stop station for American Airlines on its New York-Buffalo run.

Harold D. Swank is field manager.

St. Louis Mail Increases

THE ST. LOUIS Post Office dispatched 1644 pounds more air mail during the months of September and October than for the same period last year.

Receipts of air mail in September-October, 1934, amounted to 13,366 pounds. Outgoing mail during the two months of this year weighed 12,488 pounds.

Missouri Port To Be Sold

THE CITY of Mexico, Mo., is advertising for bids for the sale of its municipal airport, a 246-acre tract, two miles from the city. Several years ago the city paid $11,200 for the tract, buying it as a prospective site for a railroad terminal unit, but business conditions halted negotiations and the farm has since been used as an airport.

Hangar Plans Progress

EVERY EFFORT will be made to start work on the proposed hangar at the Little Rock, Ark., municipal airport within two months, Mayor Knowlton announced following a decision of the Arkansas Supreme Court which held that the city may borrow $69,500 from the PWA for the project. The hangar would include an administration section for all airport offices, a lobby and waiting room. The building will be brick and steel, of fireproof construction. Plans have been completed for several months.

Oklahoma City To Improve Port

IMPROVEMENTS COSTING $11,822 to be made at the Oklahoma City municipal airport include construction of a garage near the north hangar, a ramp in the basement of the terminal building for the movement of materials, a graveled runway extending northwest across the field and extension of the north-south and east-west runways.

Activity at Niles Increasing

STUDENT PILOTS at the Niles, Mich., airport, have increased from two to 14 during the summer. The airport is now the base for six planes owned by local residents, and is the scene of frequent flying meets and exhibitions.

Airway Beacons Installed

THE MICHIGAN State Department of Aeronautics recently completed the installation of airway beacons at Sturgis and Coldwater, both beacons being in operation daily from sunset until sunrise. An additional beacon was erected on Bundy Tower, approximately five miles west of Somerset along the Detroit-Chicago airway.

The Department is now operating ten airway beacons along the Detroit-Muskegon airway.

Aircraft Brokers Organized

AMERICAN AIRCRAFT Co., a new firm of aviation brokers, has been formed in Portland, Ore., with offices and shops at the Swan Island Airport where the financing and sale of new and used airplanes and the development of a sales plan will be handled. Heading the organization is M. H. Jones, president; James L. Meadows, vice-president; and Stewart Weiss, secretary-treasurer.

Kirsch Airport Improved

BEACON, GROUND lights and other equipment have been installed in the Kirsch airport, the municipal field newly established at Sturgis, Mich., being used for emergency landings on the main route of the American Airlines. High tension power lines in proximity to the field are being moved, and the runways completed for handling heavy ships.

Flying Service Discontinues

AERECO FLYING Service, Fort Wayne, Ind., with headquarters at the Paul Baer Municipal airport, has been dissolved, and its equipment sold. Earlier plans for the sale of the service as a going concern at Fort Wayne were not carried through; and in October the equipment, consisting of a Fleet Trainer and a Curtiss Robin, was sold to purchasers at Hartford, Conn. The Aereco service had been operating for a number of years.

ATA Rating Sought By Tulsa

AN IMPROVEMENT program now under way at the Tulsa, Okla., municipal airport will, according to Charles W. Short, Jr., manager, give the port an ATA rating. The program includes re-oiling and runways approaching the asphalt the hard-surfaced slabs, repainting border markers and installing additional lighting facilities.

Santa Cruz Field Dedicated

MORE THAN 40 planes participated in the two-day air show on November 11-12 at the dedication of the Santa Cruz airport at Capitola, Calif.

The site was presented to the city by Fred Hihn and its development made possible by Noel Patterson, Claude Wilson, the airport manager and Hollis Peck of the Santa Cruz Flying Club.

Among the participants were John Preston and J. Myrten Johnson, with Capt. William Royle at the microphone. The program included stunt and acrobatic flying, and parachute jumps.

Douglas Service to Miami Opens

EIGHT-HOUR service between New York and Miami over the 1200-mile route was inaugurated November 19 by Eastern Air Lines using the first of a fleet of nine new Douglas transports recently ordered in an expansion and schedule speed-up program.

Two round trips, with passengers, mail and express, are flown each day on a limited stop basis, with the stops approximately 175 miles apart. On the daylight flight, stops are made at Washington, Raleigh, Savannah and Jacksonville; the night flight stops are at Washington, Charleston and Jacksonville.

The flagship of the EAL fleet is the "Florida Flyer" which set a new transcontinental record of 12 hours 4 minutes before going into regular service.

TWA Moves To Bennett Field

TRANSFER OF passenger, mail and express operations of TWA, Inc., from Newark, N. J., to Floyd Bennett Field, New York's municipal airport at Brooklyn, N. Y., will take place sometime this month, and a seaplane taxi service inaugurated in the near future to ferry passengers from the field to the Wall Street and mid-town ramps, saving considerable travel time.

The airport is undergoing much improvement work, including construction of repair shops and personnel quarters. Two hangars are being equipped to house TWA's Douglas airliners.

Newark, meanwhile has agreed to give the other operators free rental and forego other charges for the first six months of next year. The city has also agreed to improve the runways by lengthening and hard-surfacing them and to install additional lighting equipment.

New Passenger Service Gains

THE FIRST month's business in passenger traffic over the New Orleans-Houston airway exceeded expectations of the Robertson Airplane Service Co., St. Louis. Three Ryans are in service and frequently reservations have outnumbered the seating capacity, according to F. H. Robertson, president of the company.

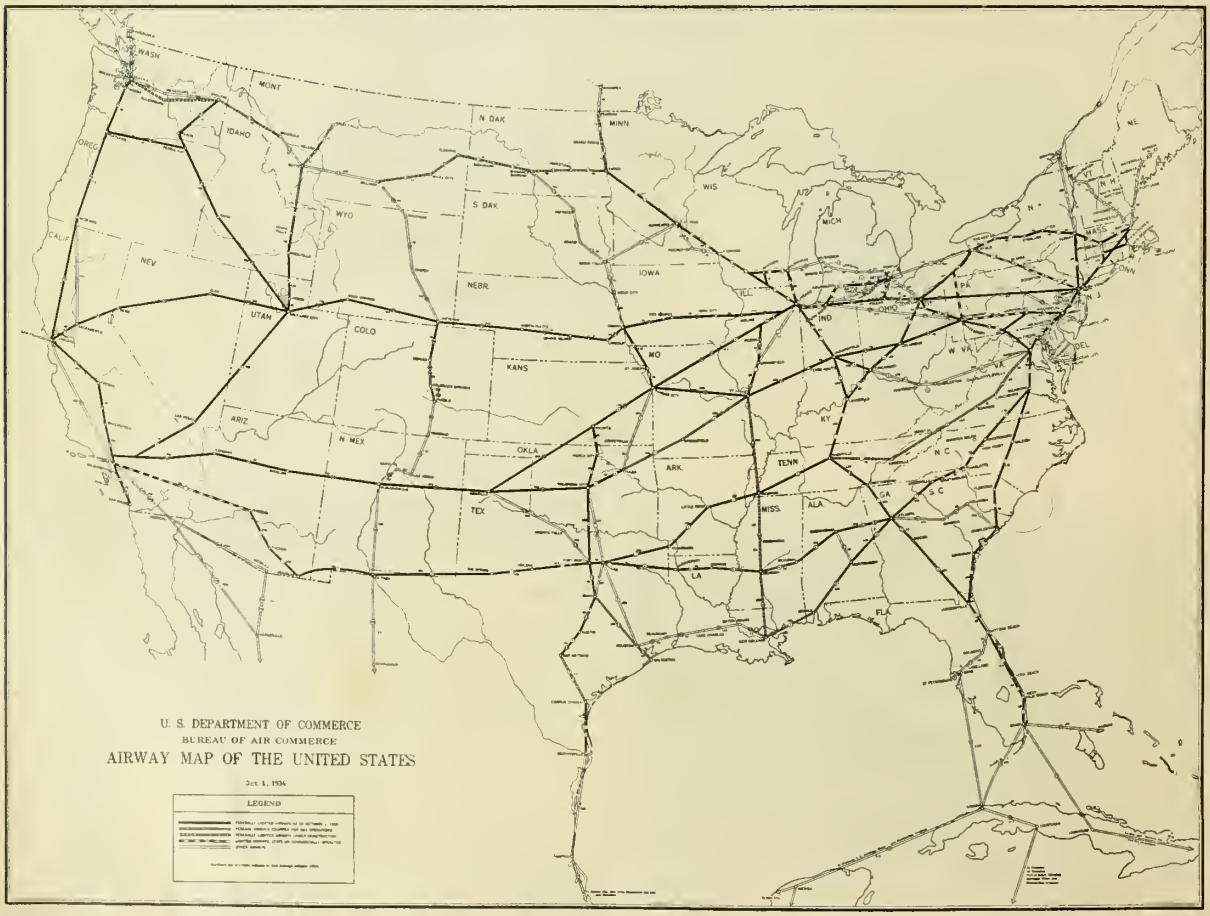
Pacific Seaboard Traffic Up 600%

ST. LOUIS passenger and express traffic over Pacific Seaboard Air Lines, Inc., increased more than 600 per cent in October as compared to the same month last year, according to W. H. Hottel, assistant general traffic manager. The principal increase is in St. Louis-Memphis passenger business.

56,411 Passengers Flew in August

SCHEDULED OPERATIONS of air transport lines of the United States for August, 1934, show increases in express and mail poundage, passengers and passenger miles in comparisons with the preceding month.

According to the Aeronautical Chamber of Commerce, air express totaled 311,011 pounds, an increase of 33.4% from July and representing a new all-time monthly high. Air mail reached 781,497 pounds, the highest it has been in 1934, while 56,411 passengers were flown 23,363,379 passenger miles. For the first eight months of the year 329,020 passengers were carried.



No Decrease in Winter Schedules

UNITED AIR Lines' winter schedules will be substantially those which have been in effect in the fall and the company will fly in excess of 1,000,000 miles a month, providing eight schedules a day between Chicago, Cleveland and New York, three coast-to-coast trips, and one round-trip a day between Chicago and Kansas City. Included in its activities on the Pacific coast will be seven round-trips daily between San Francisco and Los Angeles.

There are now only four stops between Los Angeles and Chicago, and six to New York on United's midcontinent route. The November schedules were 2¾ hours faster eastbound and 2 hours faster westbound than those of the previous month.

Through changed connections with Pennsylvania Air Lines at Cleveland, United has also speeded up its service from California to Pittsburgh and Washington. It now has a 5 hour 5 minute service from Chicago to Washington via Cleveland.

Scheduled Airway Operators

Route No.	Operator	Routes Operated	Route Mileage	Class of Service
①	American Airlines, Inc	New York to Springfield, Mass	124	MPE
		Dallas to Los Angeles	1323	MPE
		Chicago to New York (via Buffalo)	774	MPE
		Boston to New York	192	MPE
		Boston to Cleveland (via Buffalo)	591	MPE
		Cleveland to Nashville	469	MPE
		New York to Nashville	808	ME
		Washington to Chicago (via Charleston, W. Va.)	679	MPE
		Cleveland to Detroit	93	PE
		Chicago to Fort Worth (via St. Louis)	950	MPE
		Nashville to Fort Worth	658	MPE
		New York to Montreal	332	MPE
		Chicago to Detroit	206	MPE
②	Bowen Air Lines, Inc	Fort Worth to Houston	255	PE
		Dallas to Brownsville	546	PE
③	Braniff Airways, Inc.	Chicago to Fort Worth (via Kansas City, Tulsa & Oklahoma City)	945	PE
		Chicago to Dallas (via Kansas City & Wichita)	965	ME
④	Central Airlines, Inc.	Washington to Detroit	459	MPE
⑤	Chesapeake Air Ferries, Inc	Baltimore to Ocean City	123	PE
⑥	Delta Air Service Corp.	Dallas to Charleston, S. C.	1061	MPE
⑦	Eastern Air Lines, Inc.	New York to New Orleans (via Atlanta)	1296	MPE
		New York to Miami (via Charleston, S. C.)	1144	MPE
		Chicago to Jacksonville	933	ME
		New York to Washington	209	PE
⑧	Alfred Frank	Salt Lake City to Great Falls	489	MPE
⑨	General Airlines, Inc.	San Diego to Salt Lake City	702	MPE
⑩	Gorst Air Transport, Inc.	Seattle to Bremerton	15	PE
⑪	Hanford Tri-State Airlines Corp.	St. Paul to Kansas City	529	MPE
		Sioux Falls to Bismarck	315	MPE
		Chicago to Winnipeg	834	MPE
⑫	Island Airlines, Inc.	New Bedford to Nantucket	50	PE
⑬	Long & Harmon, Inc.	Fort Worth to Brownsville	516	MPE
		Fort Worth to Galveston	288	MPE
		Fort Worth to Amarillo	315	MPE
⑭	National Airways, Inc.	Boston to Bangor	213	MPE
		Boston to Burlington	193	MPE
		Burlington to Montreal	73	PE
⑮	National Air Lines System, Inc.	Daytona Beach to St. Petersburg	149	MP
⑯	New York Airways, Inc.	Atlantic City to New York	97	PE
		Atlantic City to Philadelphia	57	PE
⑰	Northwest Airlines, Inc.	St. Paul to Chicago (via Milwaukee)	408	PE
		St. Paul to Chicago (via Rochester)	356	PE
		St. Paul to Fargo	215	PE
		Fargo to Seattle	1267	MPE
⑱	Pacific Seaboard Air Lines, Inc.	Chicago to New Orleans	872	MPE
⑲	Pan American Airways, Inc.	Miami to Havana	229	MPE
		Miami to San Juan	1180	MPE
		San Juan to Paramanbo	1378	MPE
		Paramanbo to Buenos Aires	4840	MPE
		Miami to Cristobal (via San Salvador)	2228	MPE
		Miami to Cristobal (via Kingston & Barranquilla)	1810	MPE
		Barranquilla to Port of Spain	1021	MPE
		Miami to Nassau	168	MPE
		Tampa to Havana	339	PE
		Brownsville to Mexico City (via Tampico)	496	MPE
		Mexico City to San Salvador	951	MPE
		Kingston to Port au Prince	304	PE
		Port au Prince to Santo Domingo	161	PE
		Belem (Para) to Manaos	852	PE
		Vera Cruz to Merida	530	PE
⑲a	Pan American Airways, Inc. (Aerovias Centrales)	Los Angeles to Mexico City	1684	PE
		El Paso to Durango	663	PE
		Nogales to Mazatlan	665	PE
⑳	Pan American Grace Airways, Inc.	Cristobal, Canal Zone to Montevideo, Uraguay (via Santiago, Chile)	4552	MPE
㉑	Pennsylvania Airlines & Transport, Inc.	Washington to Detroit	410	PE
		Detroit to Milwaukee	265	MPE
㉒	Robertson Airplane Service Co.	Houston to Orleans	329	MPE
㉓	Seattle-Victoria Air Mail, Inc.	Seattle to Victoria	74	M
㉔	TWA, Inc.	New York to Los Angeles (via Chicago)	2594	PE
		New York to Los Angeles (via Columbus & St. Louis)	2567	MPE
		New York to Chicago (via Pittsburg)	756	PE
㉕	United Air Lines, Inc.	New York to San Francisco	2647	MPE
		Kansas City to Chicago	411	PE
		San Diego to Seattle	1161	MPE
		Salt Lake City to Seattle	816	MPE
		Pendleton to Spokane	169	PE
		Spokane to Seattle	230	PE
		Seattle to Vancouver	119	PE
㉖	Varney Speed Lines, Inc.	Pueblo to El Paso	519	MP
		Denver to Pueblo	103	P
㉖a	Varney Speed Lines, Inc. (Lineas Aereas Occidentales)	Los Angeles to Mexico City (via Nogales)	1682	PE
㉗	Wilmington-Catalina Airline	Wilmington to Avalon	31	PE
㉘	Wyoming Air Service, Inc.	Cheyenne to Pueblo	199	MPE
		Cheyenne to Billings	380	MPE

M—MAIL P—PASSENGER E—EXPRESS

Death Valley Service Operating

WILLIAMS AIR Service inaugurated regular schedules between Grand Central Air Terminal, Glendale, Calif., and the new Furnace Creek Airport in Death Valley on November 1. Fairchild and Stinson planes, equipped with two-way radios are used, with Paul Williams, Charles Frith and Rod Keenan as pilots.

One round-trip daily is made, with a stop at Trona. Base operations are at the new airport in Death Valley.

Braniff Curtails Schedules

PASSENGER SERVICE beyond Kansas City to Chicago was discontinued by Braniff Airways, Inc., in line with the company's previous policy of curtailing passenger service during the winter. The change has no effect upon the line's night mail planes.

Although the company still is considering transfer of its shops from Oklahoma City into the United Air Lines hangar at Dallas, the deal has not been closed.

Speedier Mail Service Sought

A CHANGE in air mail schedules from the west coast is sought by Provo, Utah, to give intermountain points a 12-hour advantage. Mail now leaving San Francisco and Oakland on night planes would, it is felt, better be taken on planes leaving coast terminals at 8 a.m., arriving in Salt Lake at 2 p.m., and speeding up delivery, it is pointed out.

Philadelphia Service Improved

SPEEDING UP of air passenger service from Philadelphia to various points in the mid-west and Pacific coast resulted through schedule changes made effective October 1 by United Air Lines. Time from Philadelphia to Detroit was cut to four hours, and passengers leaving the Quaker City at 11 a.m. reach all major Pacific coast cities at breakfast-time the next morning.

Express Shipment Weighs Half Ton

THE LARGEST shipment of air express ever received at Grand Central Air Terminal, Glendale, Calif., arrived via TWA. It weighed 1,004 pounds and consisted of 137 boxes of electrotypes being sent to California newspapers.

Speedier Equipment Brings Business

THE PASSENGER flow averages through Grand Central Air Terminal, Glendale, Calif., present an interesting comparison between the last year when TWA used the old Ford transports and this year when the new Douglas 14-passenger equipment was put into operation.

During the last year of the Fords, they averaged nine passengers per flight. Since inauguration of the new Douglas service, the average has been thirteen per flight. Elimination of the slower equipment and replacing them with the Douglas 200 mile-per-hour service developed a passenger flow gain through Grand Central Air Terminal alone of more than 35 per cent.

American Douglas Sets Record

AMERICAN AIRLINES made a new commercial speed record on the Fort Worth-Chicago run, covering the 824 miles in 3 hours 52 minutes, at an average speed of 213 miles an hour. The previous best time on the run was 4 hours 22 minutes. A Douglas airliner, first of a fleet of 10 put into operation by the company with Pilots J. G. Ingram and William B. Lester at the controls, carried seven passengers and express while making the record.

New Airways Lights Operating

FOUR ROTATING beacon lights on the Galveston-Waco airway were put into operation October 26 and it is expected that all beacon lights on this new airway will be in operation soon. The lights now operating are of the 24-inch rotating type, each having two course lights. They are located six miles east of Wellborn, Tex., four miles north of Bryan, one mile northeast of Highbank and one mile northeast of Guda. The remaining beacons yet to be turned on are at La Marque, League City, Satsuma, Hockley, Whitehall, Navasota, Hearne and Hammond, Tex. Lighted intermediate landing fields are being established at Navasota and Hammond, where it is expected the lights will be illuminated within the next three months.

Northwest Airlines Speeds Service

FAST SCHEDULES between Chicago and Seattle were inaugurated November 5 when multi-motored Lockheed *Electra* service was established by Northwest Airlines over the entire northern transcontinental route.

The new schedules call for a total elapsed time between Chicago, the Twin Cities and Seattle of 14 hours 45 minutes westbound and 15 hours 15 minutes eastbound, flying over the shortest route between Chicago and Seattle.

Under the new schedule, planes leave Chicago at 5:00 a.m. and arrive in Seattle at 5:45 p.m., from Seattle planes leave at 5:30 a.m. and arrive in Chicago at 10:45 that evening.

Kinner To Increase Production

POINTING TO a growing demand for low-priced sport and training planes, W. B. Kinner, president of the Security National Aircraft Corp., Van Nuys, Calif., announced that the company had completed and delivered its fifteenth Security Airster and was preparing to start production of 25 additional 2-place, low-wing monoplanes. In addition, the company is beginning work on a new 100-horsepower, air-cooled engine for sport and training airplanes, Kinner said. Designed for economy of operation and ease of maintenance, the new engine will be built primarily for the folding-wing Airster, but will be offered to other airplane manufacturers when it is in quantity production.

R. Hesselberg-Meyer A/S, of Oslo, Norway, has been appointed exclusive sales agent for the Security company in the Scandinavian countries, and has purchased a special Airster as a demonstrator.

Because suitable landing fields in the Scandinavian countries are scarce, the new Airster for Norway is being equipped with a convertible landing gear for use with pontoons and skis as well as wheels. Floats are being installed by the Edo Aircraft Corp., College Point, N. Y., before shipment to Norway. Skis will be installed after delivery in Europe.

100th Double Row Engine Completed

THE 100th double row engine turned out by the Pratt & Whitney Aircraft Corp., E. Hartford, Conn., since that type in both the Wasp and Wasp Junior sizes was put into production, was completed in October.

The engine was a Twin Wasp Junior with a displacement of 1,535 cu. in., rated 700 h.p., at 2,500 r.p.m., at 8,500 ft. It was built for the United States Navy and is a reduction gear propeller drive type.

The first installation of a Pratt & Whitney double row engine was in a Vought Corsair. Since then the engine has been installed in a number of interesting experimental projects being conducted by the Navy, including a Grumman amphibian scout and a single engine Martin bomber and torpedo plane.

AIRCRAFT OUTPUT GAINS; 1285 UNITS PRODUCED

AIRCRAFT MANUFACTURERS produced 1,285 aircraft during the first nine months of 1934, which according to the Bureau of Air Commerce, is 220 more than were manufactured during the same period in 1933.

Of the 673 commercial craft for domestic use, 518 were monoplanes; 213 being open cockpit and 305 cabin types. The biplanes included 110 cabin craft and 45 open cockpit types. Production for military delivery reached 306 units and a similar number were produced for the export market.

Timken Appoints Moore

WHITLEY B. MOORE has been appointed General Manager of the Industrial Division of The Timken Roller Bearing Co., Canton, Ohio. At the close of the war Moore joined the Timken engineering staff and subsequently became associated with the sales engineering staff.

In 1921, he was transferred to the Pacific Coast in charge of sales in that territory; in 1924 he was made assistant general sales manager of the industrial division, and in 1930 he was elevated to the sales managership.

100 New Receivers Ordered

ONE HUNDRED airway radio beacon receivers of a new type designed by the communications department of United Air Lines have been ordered by United Air Lines from the Western Electric Company, with deliveries already under way at this time. More selectivity and greater sensitivity are major features of the new radio unit.

Kingsford-Smith's P. & W.-powered Lockheed which made the trans-Pacific flight

57,023,426 Gallons of Fuel Used

CIVIL AND government aircraft in the United States consumed more than 57,000,000 gallons of gasoline and almost 2,000,000 gallons of oil during 1933, according to a survey made by the Bureau of Air Commerce.

Civil aircraft in scheduled air transport service and miscellaneous operations used 26,326,796 gallons of gasoline and 924,411 gallons of oil and 8,861,104 gallons of gasoline and 368,681 gallons of oil, respectively, for a total of 35,187,900 gallons of gasoline and 1,293,092 gallons of oil.

Government aircraft (including Army, Navy, Marine, Bureau of Air Commerce, National Guard, and the Coast Guard) consumed 21,835,526 gallons of gasoline and 706,367 gallons of oil. The grand total is 57,023,426 gallons of gasoline and 1,999,459 gallons of oil.

Approved Type Certificates Issued

THE BUREAU of Air Commerce of the Department of Commerce has awarded approved type certificates during the past month to the following aircraft:

Lockheed Aircraft Corp., Burbank, Calif., model Orion 9F-1, a 5-place closed land monoplane powered by a Wright Cyclone SR-1820F-3 engine rated 650 h.p. ATC 557.

Boeing Aircraft Corp., Seattle, Wash., model 247-D and 247-E, 13-place closed land monoplane powered by two P. & W. Wasp S1H1-G (247-D), or S1D1-G (247-E) engines rated 550 h.p. each. ATC 558.

In the components and accessories division, ATC 47 was awarded to Bendix Aviation Corp., South Bend, Ind., covering its type C 15.00-16, magnesium cast, landing gear wheel, which has an approved static load of 10,200 lbs.

United Export Company Organized

UNITED AIRCRAFT Exports Corp. has just been formed as a new subsidiary of United Aircraft Corp. Offices of the new company will be located in East Hartford, Conn., where it will take over the business and the assets of United Aircraft Exports, Inc., a subsidiary of the former United Aircraft & Transport Corp.

Charles W. Deeds, former vice-president of the Pratt & Whitney Aircraft Co., has been elected president of the new organization, J. Reed Miller has been elected secretary and treasurer and E. B. Haines and Stephan A. McClellan have been elected assistants to the president.

The new corporation will handle all export business for Pratt & Whitney, Chance Vought, Hamilton Standard, United Airports of Connecticut, and Sikorsky, all United Aircraft Corp. units.

The Wasp Junior-powered Waco Model D equipped for private use

Fairchild Dealer Progressive

TO PROMOTE sales of Fairchild airplanes, St. Louis Flying Service, Inc., of St. Louis, has set up a fund to finance the trading in of used airplanes for new ships, according to W. W. Kratz, vice-president of the corporation, which is Fairchild distributor in the Central states. In the first two months that the St. Louis company has had the distributorship, three "24's" and one "22" have been sold.

New Company Incorporated

BEELER AIRCRAFT Sales has been incorporated at Lincoln, Neb. Incorporators are R. A. Nelson and M. W. Beeler.

Kellett Appoints Sky Ad Licensees

THE FOLLOWING firms have completed arrangements with the Kellett Autogiro Corporation Sky Ads Division to act as exclusive licensees and representatives for Kellett Sky Ads in their particular countries: Brazil: Antonio Lartigau Seabra, Rio De Janiero; Cuba: Crusellas y. Compania, S/A, Havana; Argentine, Paraguay and Uruguay: Tri American Aviation, Inc., Buenos Aires; and in Puerto Rico: H. & N. Basso Airways, San Juan.

In addition, licensing agreements have been completed in this country with: John Abiuso, Southern Pennsylvania; Licon Airways, Inc., Eastern Florida; Bloomsburg Flying Club, Eastern Central Pennsylvania; Soule Autogiro Sales Co., Northeastern Pennsylvania; Link Aeronautical Corp., Cortland, N. Y.; Eckel's Air Service, Inc., Washington, N. J.; Ehlinger & Higgs, Inc., Oklahoma and Aviation Associates, Inc., Eastern Central Missouri and Western Central Illinois.

. Digest of Recent Events .

Jones-Waller Hold New Flight Marks

CATHCART JONES and Kenneth Waller completed their round-trip flight between England and Australia in 13 days 6 hours 43 minutes, a new record for the 22,600 miles. Flying their twin-engined deHavilland *Comet* which placed third among the winners in the MacRobertson Speed Race, the English pilots flew to a new record between Darwin and England, negotiating that leg of the flight in 5 days 15 hours 43 minutes, or 3 days 6 hours faster than the former mark. NOV. 2

Kingsford-Smith and Taylor Span Pacific

WITH 2,408 miles of non-stop flying behind them, Sir Charles Kingsford-Smith and Capt. P. G. Taylor landed at the Oakland, Calif., airport, just one minute short of 15 hours out of Honolulu, bringing to a close their three-stage flight of 7,350 miles from Australia, the Fiji Islands and Hawaii. Their plane was the P. & W. powered Lockheed Altair *Lady Southern Cross,* their time about nine hours better than the old record, and their elapsed flying time from Australia 51 hours. NOV. 4

Douglas Sets New City-to-City Records

NEW SPEED records were established by a TWA Douglas flying its regular run over the Chicago - Pittsburgh, and Pittsburgh-New York legs of the Kansas City-New York schedule. Between Chicago and Pittsburgh, its average was 223 m.p.h.; between Pittsburgh and New York, it was 246 m.p.h. Total flying time from Chicago to New York (725 miles) was 3 hours 7 minutes, averaging a speed of 232.6 miles per hour. NOV. 8

Douglas Sets New Coast-to-Coast Mark

FLYING AT an average speed of 216.3 miles an hour, a Douglas airliner owned by Eastern Airlines completed a Burbank, Calif., to Newark, N. J., flight in 12 hours 3 minutes 50 seconds, cutting 58 minutes 10 seconds from the best previous mark for a commercial plane. Capt. E. V. Rickenbacker, two pilots and three passengers made the trip, flying at times at an altitude of 17,000 feet. One stop was made at Kansas City, extra fuel tanks for 360 gallons precluding the necessity of additional landings for fuel. NOV. 8

Stock Plane Altitude Record Is Broken

IN A Curtiss-Wright Junior, William F. Condon ascended to an altitude of 13,400 feet, believed to be a new record for a stock plane without special equipment. The previously accepted mark was about 12,600 feet made in Coblenz, Germany. Condon was in the air over Brockton, Mass., for 82 minutes. NOV. 11

Transport Rises 5 Miles In Peru to Set Record

ASCENDING 26,100 feet, a standard tri-motored Ford owned by Pan American Grance Airways and piloted by T. D. Jardine, central division superintendent, broke the Peruvian as well as the South American altitude record. Cosmic ray observations from the plane were conducted by Prof. S. A. Koriff, of the California Institute of Technology, who for some time has made such studies around Mount El Misti near Arequipa in Peru. NOV. 12

Piccards Reached 57,979 Feet in Flight

AN ALTITUDE of 57,979 feet, or close to 11 miles, was attained by Dr. and Mrs. Jean Piccard on their last stratosphere flight. They took off from the Ford Airport, Dearborn, Mich., shortly after daybreak Oct. 22 and landed near Cadiz, Ohio, that afternoon. NOV. 17

. Coming Events .

Air Show

Fourteenth International Aero Salon, Paris, France. NOV. 16-DEC. 2

SAE Meeting

Aviation night, Metropolitan Section, Society of Automotive Engineers. DEC. 10

Challenge Race

Handicap race for Viceroy's Challenge Trophy. From Calcutta to Bombay. DEC. 15-16

Miami Races

Seventh Annual All-American Air Races, Miami Municipal Airport, Miami, Fla. JAN. 10-12

Boeing Competition

Entries for Sixth Annual Wm. E. Boeing Scholarships close. Boeing School of Aeronautics, Oakland, Calif. MAR. 15

Martin Boat Nears Test Stage

THE FIRST of three flying boats constructed for transoceanic passenger-carrying service, will be completed at the Glenn L. Martin plant in Baltimore, Md., this month and launched on her trial flights. The planes are being built for Pan American Airways. The second boat will be completed and get its trial flight next spring, while the third will take the air next summer.

The planes are constructed of duraluminum, and will weigh 23,000 pounds empty and 51,000 pounds loaded. Four P. & W. double row engines of 800 horsepower each will furnish the power. Each plane will be capable of carrying forty-eight passengers and a crew of five, and will be equipped with sleeping accommodations and other fittings necessary for occupancy by passengers for several days.

Kenneth Ebel is expected to take the first plane up on its trial flight, which will be made before the interior furnishings equipping it for ocean travel have been installed.

S-T Production Behind Orders

THE INITIAL group of the new Ryan S-T low-wing monoplanes has been sold in advance of production, according to Earl D. Prudden, vice-president of the Ryan Aeronautical Co., manufacturers. While efforts are being made at the San Diego factory to meet the demand for this new plane, it is expected production schedules will not meet delivery dates on back orders until the end of the year.

The Ryan company also announced that Leonard R. Peterson, Inc., Seattle, Wash., has been appointed northwest distributor. Peterson will use the Ryan S-T for primary training and advanced aerobatics at his school at Boeing Field.

Harry Payne Bingham, Arlington, Vt., has ordered an S-T super sportster. Further announcements by the company reported that Walter Locke was appointed purchasing agent and Verne Murdock was added to the production department.

Production line in Boeing factory as ten 247-D's neared completion

Pitcairn Exports Autogiro

ACCOMPANYING JIMMY Ray when he sailed for Europe recently was a PA-24, four-place cabin autogiro which will be delivered to the manufacturer of Guinness "Stout." This is the second giro Guinness has purchased, and is a duplicate of the one he took delivery on last year.

Guinness uses his aircraft to fly between Dublin and London where his business interests are located. The PA-24 is powered by a Wright Whirlwind engine of 420 h.p., has fixed cantilever wings and tail surfaces, and a tilting rotor system for longitudinal stability.

Stinson Distributor Appointed

AIRCRAFT INDUSTRIES, Inc., through its president, Major C. C. Moseley, and the Stinson Aircraft Corp., through its general western factory representative, Lee H. Smith, closed a contract whereby the former will act as distributor in Southern California and as the service agency throughout the Pacific coast district for the latter company's products. Headquarters, sales rooms and service shops will be at Grand Central Air Terminal, Glendale, Calif., for Stinson airplanes, Lycoming aircraft engines and Smith controllable-pitch propellers.

Ten 247-D's Delivered

DELIVERY TO United Air Lines of ten new high-speed, twin-engined Boeing 247-D transport planes was completed last month by the Boeing Aircraft Co., Seattle, Wash.

Performance figures show that the twin-Wasp 247-D has a top speed of 200 miles an hour and can climb to 11,500 feet on either of its engines. At the same time, it embodies a variety of improvements in passenger comfort facilities as compared to its predecessor, the 247.

In all, the Boeing company produced 75 Model 247 and 247-D transports. Of these, 70 have gone to United Air Lines, three have been purchased by Deutsche Luft Hansa in Germany and one was flown by Colonel Roscoe Turner and Clyde Pangborn to place among the winners in the MacRobertson race.

Coordinating Committee Organized

FOUR AERONAUTICAL organizations have formed a Joint Aviation Coordinating Committee to promote the interest of civil aviation in this country. Eight members will make up the group, two each representing the Aeronautical Chamber of Commerce, the Independent Aviation Operators of the U. S., the N.A.A., and the National Association of State Aviation Officials.

Among its first acts, the committee recommended the establishment of a permanent federal aviation commission to have complete control of all phases of civil aeronautics.

Collins Joins Lambert Staff

OF INTEREST to a wide circle of friends throughout the Middle West, is the appointment of L. H. Collins as sales representative of the Lambert Aircraft Corp., the Robertson, Mo., builders of Monocoupes. Collins will center his operations in the Texas, Oklahoma and Louisiana area during the winter months.

(Continued on following page)

(Continued from preceding page)

Tower Test-Flying Eight Years

EIGHT YEARS of test flying Boeing planes, including everything from tiny pursuits to large multi-motored transports, have been completed by Les Tower of the Boeing Aircraft Company, Seattle.

Tower joined the company as draftsman in 1925 after completing an engineering course at the University of Washington. He gained flying experience with the Army Air Corps and started test flying Boeing planes in 1926. Since then he's taken up virtually every new type commercial and military Boeing plane.

Largest Blimp at Holmes Airport

THE NEW Goodyear dirigible *Enterprise,* largest of its type, is now based at Holmes Airport, Jackson Heights, New York, where it flew from Akron, Ohio. The 450-mile flight was made in about 8 hours with Verne Smith at the controls.

The ship measures 148 ft. in length, 40 ft. in diameter and has a helium gas capacity of 123,000 cu. ft. It is powered by two engines, has a top speed of 68 m.p.h., and a cruising range of 700 miles when carrying its full 100-gallon supply of fuel.

It can accommodate eight persons, and has a ceiling of 9000 ft.

Higher Octane Fuels Planned

WITH PLANS under way for a transpacific air service from California to the Orient, American oil companies have intensified research on commercial production of aviation fuels of extremely high anti-knock quality, according to Dr. Graham Edgar, vice-president of the Ethyl Gasoline Corp., owned jointly by General Motors Corp., and the Standard Oil Company of New Jersey.

The proposed use in this service of six flying boats, each capable of carrying 32 passengers, indicates the trend toward engines of greater horsepower requiring improved fuel, said Dr. Edgar, in a report of a study of recent progress in aviation.

Experimental fuels of 100 octane number, and above, have been produced, and Dr. Edgar believes aircraft engines of the near future will require gasoline of that quality, and that there is no limit to the usefulness of higher anti-knock values. Within reasonable limits, the power that can be developed from a supercharged aircraft engine is approximately proportional to the octane number of the available fuel.

North American Profit $455,095

ACCORDING TO E. R. Breech, president, North American Aviation, Inc., and wholly owned subsidiaries reported a net loss of $744,846.52 in the first nine months of 1934 after deducting depreciation charges of $264,957.58 but before including a profit of $1,199,941.92 realized from the sale of securities. Including the latter, the first nine months of 1934 show a net profit of $455,095.40.

The net profit of $455,095.40 would be reduced to $300,452.37 if there were included therein, North American Aviation's proportion of the net loss of subsidiary not consolidated in which a majority stock interest is held.

Taylor Exports Cubs

EXPORT SALES of the Taylor Cub have increased and during the past few months planes have been delivered in the Hawaiian Islands and Canada, as well as to Brazil, Czechoslovakia and the Panama Canal Zone.

According to Ted Weld, sales manager of the company, which is located in Bradford, Pa., four planes have already been sold in Brazil and three in the Panama Canal Zone.

De-icers Planned For Electras

ARRANGEMENTS HAVE been made by Northwest Airlines, Inc., to equip the wings and the propeller hubs of their fleet of Lockheed Electra passenger planes with de-icers. Inasmuch as the airline's business has shown a steady increase this Autumn, it is preparing for extensive winter flying and the maintenance of regular schedules.

United Orders De-Icers

FOLLOWING A year of experimental work and service tests, United Air Lines has placed an order for thirty new-type de-icing units for installation as standard equipment this winter on a like number of its Boeing transports. Deliveries of the de-icers will be made by the B. F. Goodrich Company, and the planes are now being prepared so that the units may be installed at the rate of two a day.

This type of de-icer is considerably lighter than previous similar devices, and completely installed adds only 75 pounds to the total weight of the airplane.

The shoes are composed of articulated tubes of stockinette, a specially knitted fabric, covered with wax-finished rubber. Nine shoes will be required on each transport. Three-tube shoes are used on the leading edges of the outer wing panels, four-tube shoes on the wings between the landing lights and the nacelles and on the stubs between the nacelles and the fuselage, two-tube shoes on the leading edges of the stabilizers and a one-tube shoe on the vertical fin.

Air is supplied from the vacuum pumps, one on each of the plane's Wasp engines, to an oil separator filled with prosphor-bronze gauze. The cleaned air is then routed, at a constant pressure of five pounds, to a distributor valve operated by a 12-volt motor through a 1120-1 reduction gear, the distributor making one revolution per minute.

From the distributor valve, ¾-inch dural tubes lead to the de-icing boot valves installed in the skin of the plane on the leading edges of the wing and tail surfaces.

Propeller hubs are equipped with rubber-covered spinners and the hub-ward portions of the blades are protected with sheet-rubber strips, treated with a special de-icing oil. The section of the fuselage opposite the propellers is made of heavier metal to withstand the buffeting of the ice thrown from the propellers.

Kohnstamm Heads Lighting Division

F. R. KOHNSTAMM has been appointed manager of the Lighting Division of the Westinghouse Electric and Manufacturing Company, according to President F. A. Merrick. In his new position, Mr. Kohnstamm will supervise all lighting activities, including sales, engineering and manufacturing, now conducted at the Westinghouse Cleveland Works, in Edgewater Park. Until his appointment, he was sales promotion manager of the Westinghouse Company, maintaining his headquarters at East Pittsburgh, Penn.

Heath Production To Be Resumed

PRODUCTION OF small planes is to be resumed at Niles, Mich., by International Aircraft Corp., according to plans announced by C. Duke Miller, who will be in charge of production and management.

The International Aircraft is a reorganization of the Heath corporation, one of the early builders of small planes. For the last two years there has been no production at the plant, activities being restricted to repairs and replacement. A number of trained workers will be added to the plant personnel, and manufacture will, it is reported, be resumed during the winter months.

Stratosphere Weather Studied

PREPARATIONS WERE made in November at the Lambert-St. Louis Municipal Airport for observations to determine the changes which take place in the upper air, particularly the stratosphere, during the passage of a storm center. Chris Harmantas, research assistant of the department of meteorology of the Massachusetts Institute of Technology, conducted the tests.

Ascents have been made before with sounding balloons, but in these tests the balloons are released one to two hours apart, during atmospheric disturbances.

FOREIGN NEWS IN BRIEF

Australasia

GREAT PACIFIC Airways, Ltd., has been formed in Sydney, with a capitalization of about $2,500,000 to establish a comprehensive air transport service throughout Australia. New and up-to-date equipment is to be purchased to serve every section of the country. C. T. P. Ulm is one of the directors.

THE RECENTLY organized Autogiro Corp. of Australia has taken delivery of an autogiro which it has imported for advertising, public demonstration, instruction and passenger work. The assembly was done in Australia and a British airworthiness certificate granted.

BEFORE MAKING his transpacific flight, Sir Charles Kingsford-Smith made some especially fast flights in his P. & W. Wasp-powered Lockheed Altair, the *Lady Southern Cross*.

He flew the 1,900 miles from Melbourne to Perth non-stop in 10 hours 22 minutes, beating his best previous time by about 12 hours. On a hop from Perth to Adelaide, Smith averaged 233 m.p.h., while an average of 229 m.p.h., was maintained between Perth and Sydney.

WORK ON a number of Demon biplanes ordered for re-equipment of the Royal Australian Air Force is proceeding at the Hawker factory in England. The present order covers 18 planes, all of them two-place craft which embody certain modifications to fit them for operation under Australian conditions. Similar planes will probably be used to equip new coastal defence units to be formed at Cape Town, Durban and Bloemfontein in South Africa.

MACROBERTSON-MILLER Aviation Co., holder of five-year contract for carrying the mails in northwest Australia, is planning to purchase three Dragon Moth cabin biplanes for the service. The company flies a route 2400 miles in length and with the new planes expects to maintain a three-day schedule.

Canada

FIGURES JUST released by the Civil Aviation Branch show air mail for the first half of the year amounting to 339,311 pounds, 55,000 pounds more than the same period last year. All services, except those connecting with American air mail routes were carried at regular postage. Air mail on the international routes amounted to about 28,000 pounds.

Canada's 23 government sponsored flying clubs, operated 77 planes during the six months of 1934. There were 2,126 members, 583 of whom were under instruction during that time. The clubs during the six months flew 4,289 hours, an increase of 300 hours over last year's first six months, while 58 members qualified for private pilot licenses and 20 obtained commercial pilot licenses.

Other figures show that Canada had 387 licensed private pilots, 474 commercial pilots and 433 air engineers. Licensed private aircraft numbered 37, while commercial was 296. There were 99 airharbors in operation.

The four-engined de Havilland 86

WINTER AIR mail services have gone into operation throughout eastern Canada as the first winter storms isolated sections of the Maritime provinces and the north shore of the St. Lawrence River. The latter service operates out of Quebec via Seven Islands to Natashquan and Anticosti Island. The service from Moncton, N. B., to Charlottetown and other points on Prince Edward Island operates daily. From Charlottetown a service starts in January for the Magdalen Islands, while the service from London, Ont., to Pelee Island, Lake Erie, was inaugurated this month. These winter services go to points not served by any other mail service in the winter.

K. J. R. MAIN of the Ottawa Flying Club has been appointed instructor of the Toronto Flying Club.

AFTER BEING officially closed for two years, the Toronto air harbor has been re-opened under the management of E. Leigh Capreol, until recently test pilot for de Havilland Aircraft Co. The base is within two minutes drive of the Toronto downtown business and hotel district, and is part of the marine facilities of the city where trans-ocean as well as lake freighters and lake passenger boats dock.

Denmark

SKAGEN AIRPORT has been opened at Grenen, one of the best-known watering places in northern Denmark. The landing area is immediately in front of the hotel on the beach, and has a hard surface of white sand about 325 yards wide. Skagen's lighthouse and semaphore station provide good landmarks. The proprietor of Skagens Badehotel has constructed a hangar which has accommodations for eight small planes and the field is to be provided with a customs house to facilitate inspections.

France

A NEW two-deck, 80-passenger flying boat for South Atlantic service is nearing completion in the Latécoere factory at Usine, near Toulouse. Designed by engineers of Air France, the six-engined boat is expected to have a range of 2800 miles at a 160-mile-per-hour cruising speed. It closely follows Latécoere practice, having a high-wing arrangement with stub wings taking the bracing strut stresses.

The fuselage is of metal, while the metal-ribbed wing is fabric covered. The engines are of the Hispano-Suiza 1000-h.p. water-cooled type, fairing into the wing, with the radiators of the cooling system housed in the N.A.C.A. cowlings, an installation said to prove satisfactory both aerodynamically and from the point of view of cooling.

Flight tests are expected to be made in time to have the plane ready for service by next June.

THE FOURTEENTH French aviation show is now being held at the Grand Palais in Paris. Approximately half the planes displayed are from countries outside of France and come from Russia, Germany, Poland, Austria, Czechoslovakia and Great Britain.

PASSENGER SERVICE between Marseilles and Algiers has been inaugurated by Air France, using 14-place Lior et Oliver four-motored equipment. Limited amounts of mail and express are being carried.

Germany

THE AIRSHIP now under construction at the Zeppelin Company's wharf at Friedrichshafen will be finished in March, 1935. Known as the LZ-129, it will differ from the Zeppelins constructed heretofore, being filled with helium gas, besides being differently shaped.

The new ship provides twenty-five bedrooms, with berths for fifty passengers.

(*Continued on following page*)

(*Continued from preceding page*)
The craft's maximum speed will be about 88 m.p.h.

The LZ-129 will be driven by Diesel engines delivering 5,000 h.p.

THE HIGHEST distinction of any German aviator is to receive the Hindenburg Cup, given each year since 1928 for the best amateur performance in the field of German sporting aviation. The Cup for 1933 has been awarded to Karl Schwabe for his flights to Africa covering 16,155 miles.

Great Britain

FOUR NEW high-speed transport planes for Imperial Airways are now nearing completion and two should be ready for flight tests this month. These are the Avro 652, twin-engined, 8-place monoplanes with an estimated cruising speed of 150 m.p.h. The other two jobs are Boulton-Paul derivations of the mail-carrier. They carry 7 passengers and are powered by two 460 h.p. Jaguar engines.

A NUMBER of twin-engined Overstrand combat planes with gun turrets which eliminate much of the difficulty of accurate shooting at high speeds, have been purchased by the Air Ministry. The turreted gun is an English invention, installed in the nose of the fuselage, its framework being covered with a transparent material which provides excellent visibility in all directions.

IMPERIAL AIRWAYS is about to order large planes which are expected to have the range and pay load necessary to meet transatlantic service requirements. According to Sir Eric Geddes, chairman of the company, two flying boats will be built; one to operate in the New York-Bermuda service which is to be operated jointly with Pan American Airways.

DESPITE INCLEMENT weather recently, flying time at the Air Service Training School, has reached 6,362 hours, almost equalling the flying time for the whole of last year. In September alone, more than 820 hours were logged.

SERVICE BETWEEN Hull and Amsterdam has been inaugurated by K.L.M. The city of Hull acquired an airport at Hedon and following successful operations in 1933, expects that other local services will originate from that city. Fare between Hull and Amsterdam has been set at $25 one way.

JERSEY AIRWAYS, Ltd., operating between London, Portsmouth and the Channel Islands has carried more than 7000 passengers in less than seven months and within the past few weeks the number of passengers has increased to nearly 1000 a week. On one day alone, 206 passengers flew with the company taxing to capacity the eight de Havilland Dragons operating.

The Italian Cant Z-501 seaplane which flew to a new world's non-stop record of 2,561 miles

Holland

UNDER THE auspices of the Royal Dutch Aero Club, K.L.M., the National Flying School, the Dutch Touring Club, and other leading bodies connected with aviation in Holland, the first Netherlands Traveling Aviation Exhibition recently held at The Hague has been transferred to Amsterdam. The various exhibits connected with civil and military aircraft make a representative display, and there are stands devoted to radio, meteorology, ground service, aerial photography and cartography, aircraft constructional methods, reliability testing apparatus and the equipment of passenger-carrying aircraft. K. L. M. exhibits include models of the company's aircraft employed since its inception, from the first Fokker C.2 to the F.XXXVI.

FREDERIC KOOLHOVEN who has constructed aircraft in a small factory at Waalhaven airport has now formed a limited liability company under the name of Koolhoven Vliegtuigen NV of Rotterdam. Mr. Koolhoven is Managing Director, and other directors are: C. E. van't Groenewoud, A. D. van Buuren, P. G. C. van Aalst, and J. Mees.

The Koolhoven works have been considerably enlarged, and the new company is working on orders from K. L. M., the National Flying School and others.

Italy

THE ITALIAN government has inaugurated a design competition in the aviation industry for a heavy bomber which will comply with the latest requirements of aerial warfare. Among the various models expected to enter the competition is the Savia Marchetti S-72, a ship of long range and high speed, especially at altitudes.

THE CANT Z-501 seaplane in which Mario Stoppani, Coradino Corrado and Amadeo Surion flew non-stop 2,561.5 miles from Rome to Eritrea in Northern Africa, is a standard Hispano-Suiza 850 h.p.-engined military scouting plane built by Cantieri Riuniti dell' Adriatico. The record-breaking plane has a wing span of 73 feet, carries a maximum useful load of 7,495 lbs., and attains a top speed of 161 m.p.h. Normally its range is 1,554 miles at cruising speed.

South America

ONE OF the most extraordinary accomplishments in freight transportation by air was completed when Pan American Grace Airways moved the last of 735 tons of mining machinery from Cuzco to the Huanacopampa minehead in Lima. The flights began in August, were finished early in November, involved 421 round-trips, consumed 425 hours of flying time and were made across the Andean Divide at 16,000 feet. The heaviest single unit carried weighed 4,362 pounds. Tri-motored P.&W. Wasp-powered equipment was used.

AS SOON as the municipality of Manizales cedes the land to the Colombian government, an airport will be constructed thereon so that the city can be served by a regularly scheduled air route.

AN EXTENSION of its route has given Servicio Aereo Colombia service between Medellin and Cali, with planes leaving on a bi-weekly schedule. In addition, a weekly round-trip is made between Medellin and Cartago and the regular schedule maintained between Bogota and Medellin. It is also planned to inaugurate another service between Bogota and Cucuta.

EXPORT BUSINESS

(*Continued from page* 15)

mined to acquire it. In my view, whatever policy be adopted, in order to justify its sponsorship, must work in practice and accomplish in fact the pacific purpose which it is intended to accomplish.

As to the existence of questionable practices in the export field on the part of some concerns, suggested by certain testimony which has been heard by the Special Committee investigating the munitions industry, my reply is that these practices can be eliminated in the future by proper methods of control within the limits of our present system.

Wherever international cooperation in restrictive export provisions can be procured, to the end of a concerted effort at promoting peace, or in any specific instance where the government of this country might determine that the isolated restriction of export from this country would actually (and not merely colorably) serve the ends of repressing combatant activity, it can be done effectively through a system of export control correlated with our foreign policy.

A contemplated national policy (especially in the absence of joint international action) containing any element of prohibition against the exportation of arms, aircraft or other munitions or potential munitions should be carefully scrutinized from the viewpoint of the results which would accrue therefrom.

The drastic steps which have been considered would not in fact promote international peace, but on the contrary, would simply supplant American sources of supply, transfer payrolls from American to foreign labor, invite foreign exploitation of American patents, processes and products, and other evasive practices, and quite possibly have the effect of a boomerang on pacific objectives through stimulating new sources of manufacture and new races for sales volume.

Such drastic steps are utterly unnecessary in order to insure the furtherance of our foreign policy, the observance of treaties, the conduct of export business on the highest ethical plane, and the elimination of excess profits from any war in which this country should engage—all without the necessity of causing to shrivel the enterprises and industries serving the purposes and uses of commerce and trade in peace-time, upon whose prompt convertibility into the manufacture of military material in wartime, the nation must depend for its security.

DO AIR RACES HELP?

(*Continued from page* 17)

cuit composed of racing airplanes only. But it didn't work out. We simply did not get the airplanes; there are not enough racing planes to make interesting races. So even from the show viewpoint the plan now is a wash-out.

I think it is high time we admitted our error and tried to get commercial aviation back into the air races. Everything is a matter of experiment, but it would seem reasonable to divide next year's prize money say 50-50 between racing planes and A.T.C. planes suitable for closed course racing. This business of making the races purely professional has not worked out, so let us get the ordinary pilots in ordinary commercial airplanes to re-enter the races.

Also—and this is not a small point—let the promoters of the National Air Races realize that these events were not designed solely to put money into the pockets of professional showmen. They were devised as an event at which the aviation industry should show its sale wares to the public. To-day an airplane manufacturer has considerably less standing at the National Air Races than have the lads who sell hot dogs and "pop".

The National Air Races at best provide not national but local publicity; there is not one thin dime of profit in it for the aviation industry.

ADVERTISERS' LITERATURE SERVICE

AIRCRAFT

Literature on the following available to dealers, operators, private owners, business houses:

1. BEECHCRAFT — Four- or five-place, high performance cabin; 225 to 690 h.p..Page 64

2. FAIRCHILD — Two-place, open and three-place cabin, high wing .....Page 65

3. LAMBERT—Two-place, high wing, cabin; choice of several engines .....Page 69

4. LUSCOMBE—High performance, two-place, metal, cabin. Page 62

5. TAYLOR—Two-place, high wing, tandem open cockpit, less than $2,000 .....Page 63

6. WACO—Complete line open and cabin planes, biplane models, wide range of engines. Page 57

7. NORTHROP—A 220 m.p.h. single engine transport plane designed for wealthy private pilots. Page 10

8. STINSON — A Lycoming-powered 4-place cabin monoplane .....Page 9

Literature on the following available to United States and foreign airline operators and military authorities:

9. BOEING "247D" — High speed, all metal, low wing, passenger, mail and express plane. Two engines; 10 passengers and crew .....Page 23

10. GRUMMAN — Single engine, high performance Scout and Amphibion planes doing service in U. S. Navy and Coast Guard .....Page 6

11. BELLANCA—A bi-motored 18-passenger seaplane noted for its payload capacity and economy .....Page 25

12. VOUGHT — "Corsair" single engine Navy plane of high performance .....Page 29

ENGINES

Literature on the following available to aircraft manufacturers, engineers, designers, airline officials and other users of high-powered aircraft engines, Army and Navy Officials, etc.—here and abroad:

13. PRATT & WHITNEY — Wasp and Hornet series air-cooled engines; direct drive, geared, supercharged. Back Cover

14. WRIGHT—Whirlwind and Cyclone air-cooled engines; direct drive, geared, supercharged; also Conqueror series, liquid-cooled engines . . .Second Cover

IMPORTANT

The literature of these advertisers is available only to those who are in the market for any of the products or facilities advertised in this issue. Read carefully, before filling out the coupon, the advertising of the items in which you are interested. Be sure to mention the company with which you are associated, and your position.

AIRCRAFT & ENGINE EQUIPMENT

Additional data on the following available to manufacturers, engineers, designers, operators, repair stations, government air services, etc.; also to aircraft owners in the market for replacements:

15. BERRY BROS. — Aircraft dope, lacquers, high grade finishes .....Page 57

16. B. G. — Spark plugs, mica; regular and radio shielded types. Page 2

17. THOMPSON—Intake and exhaust valves; hollow head and stem type, and cupped head and solid stem.....Third Cover

18. B. A. 30—Balloon and airplane cloth, made by Wellington Sears Co. Grade A, meets all Army and Navy spec..Page 66

19. WITTEK—"Noc-out" hose-clamps, with thumb screw, insure tight connections.....Page 66

20. EVANS — Aircraft fuel pumps; spring loaded flexible sylphon seal, flexible shaft, integral relief valve, wabble pump bypass .....Page 70

21. FLEETWINGS — "Shotweld" system stainless steel construction; "shotweld" stainless steel gasoline tanks....Page 53

22. GOODYEAR — Airwheels and Hydraulic Airwheel Brakes; other rubber products for aircraft use.....Page 21

23. GOODRICH — "Silvertown" airplane tires; 40 other rubber aircraft products.Page 35

24. GLIDDEN—Glidair Fabricote, a new refinishing for aircraft; other aircraft finishes. Page 66

25. KOLLSMAN—Precision aircraft instruments, individual direct lighting, clamp-type mounting .....Page 3

26. MACWHYTE—Streamline, square and round tie rods; cable; slings .....Page 69

27. NORMA-HOFFMANN — "Greseal" felt-protected ball bearings for controls and other aircraft use.....Page 53

28. PIONEER — Flying and navigation instruments; complete panels, individual instruments. Page 41

29. R. C. A. VICTOR—Aircraft Radiobeacon Receiver and other aircraft radio equipment. Page 7

30. SPERRY—Directional Gyro and Artificial Horizon, in wide use on the airlines, here and abroad, and numerous famous flights .....Page 11

31. VELLUMOID—Fibre Sheet Packing, water-tight; universally used in the aircraft industry for gaskets .....Page 53

MISCELLANEOUS

The following companies will gladly send their literature to those who are interested in the particular products advertised:

32. AIR ASSOCIATES — National distribution, through three branches, of well-known aircraft products, materials, etc..Page 56

33. AMERICAN—Steel sheets, the product of American Sheet & Tin Plate Co., for hangars, shops, sheds, culverts..Page 66

34. RONALD — The Ronald Press library contains 28 technical and non-technical aviation books of value to students, pilots, mechanics and engineers. Page 80

35. KELLETT—Aerial advertising; franchises available to qualified individuals or organizations. Page 69

36. MIAMI—The Seventh Annual All-American Air Races. Pilots, write for information at once .....Page 69

37. N-B—Complete line of aircraft parts, materials and accessories. Write for catalog.Page 69

SCHOOLS

School literature is available to everyone contemplating a course in aeronautical training:

38. AERO. UNIVERSITY — Bachelor of Aeronautical Engineering Degree; also master mechanics, pilots' ground courses, administration .....Page 61

39. BOEING — Oakland, Calif. Courses include Airline, Special Airline, Transport, Limited Commercial, Private and Amateur Pilot; also Airline Operations and Airline Mechanics.....Page 63

40. C-W — Glendale, Calif. Courses in Aeronautical Engineering, Master Mechanics, Home Study Drafting..Page 1

41. DALLAS — Dallas, Texas. Courses include all classes of pilot and mechanic training, aviation radio .....Page 8

42. CASEY JONES—Newark, N. J. Courses include: Aeronautical engineering, mechanics, instrument flying .....Page 43

43. LINCOLN — Lincoln, Neb. Courses include all grades of pilot, and mechanic....Page 65

44. PARKS—East St. Louis, Ill. Courses include: Executive Transport Pilot, Aeronautical Engineering, A & E Master Mechanics, Ltd. Com. Pilot, A & E Mechanics .....Page 5

45. RYAN—San Diego, Calif. Courses include: All grades of pilot and mechanic training; aerial navigation.....Page 37

46. ROOSEVELT — Mineola, N. Y. Courses include: Amateur, Private, Ltd. Com., Transport Pilot; regular and Master Mechanics ..... Page 66

47. SPARTAN — Tulsa, Okla. Courses include: Flying, mechanics, radio, instrument, executive-management .....Page 27

PLEASE ENCLOSE 3c IN POSTAGE

AERO DIGEST • 515 MADISON AVE. • NEW YORK

Please have sent to me the literature indicated here by number.

CHECK HERE: Name.....

No..... Position .....

No..... Company .....

No..... Address .....

No..... City and State.....12-34

Books For Sale by the Aeronautical Library

GENERAL

A Rabbit in the Air. *David Garnett*.....$1.50
Aeronautics, A General Text on. *Hilton B. Lusk*.....$3.25
Andree's Story. *Edited by the Swedish Society for Anthropology and Geography*.....$5
Around the World in 28 Days. *Linton Wells*..$3.50
Aviation From the Ground Up. *Lieut. G. B. Manly*.....$3.50
Beauty of Flight. *Manfred Curry*.....$5
Flying. *James E. Fechet*.....$1
Heroes of the Air. *Chelsea Frazer*.....$2.50
Learning to Fly. *Capt. C. D. Barnard*.....$5.50
Learning to Fly for the Navy. *Lieut. Barrett Studley*.....$2
Little America. *Richard E. Byrd*.....$5
Mechanics of Flight. *A. C. Kermode*.....$2.50
Pseudo-Security. *J. M. Spaight*.....$5
Seaplane Solo. *Francis Chichester*.....$2.50
Strategy and Tactics of Air Fighting. *Major Oliver Stewort*.....$2.25
The Book of the Autogiro. *C. J. Sanders & A. H. Rawson*.....$1.75
The Book of the Sky. *Matthew Luckiesh, D.Sc.*.....$3
The Conquest of the Atlantic by Air. *Charles Dixon*.....$2.50
The Far Horizon. *Henry Wysham Lanier*...$3
The Old Flying Days. *Maj. C. C. Turner*....$7.50
The Red Juggernaut (Nat'l Defense). *L. R. Moxwell*.....$1
The Sky's the Limit. *Lt. Tomlinson*.....$3.50
The Standard Airpost Catalogue. 1931-32 Edit..$2
The Story of Aircraft. *Chelsea Fraser*.....$2.50
The War in the Air. *W. Raleigh & H. A. Jones.*
Volume 1, 2, and 4, each.....$7
Volume 3.....$9
The World in the Air. *Froncis Trevelyan Miller* (2 volumes).....$15
p. *Jack Stearns Gray*.....$3
Wings of Tomorrow. *Juan de la Cierva & Don Rose*.....$2.50
Wings for Men. *Frank Wead*.....$4
Wings Over the World. *J. L. French*.....$1

ELEMENTARY

A B C of Aviation. *Capt. V. W. Page* (new edition).....$1
A B C of Flight. *Lourence LePage*.....$1.50
Aerohatics. *H. Barber*.....$3.50
Elements of Aviation. *V. E. Clark*.....$3
Elementary Aeronautics. *A. P. Thurston, D.Sc.*$2.50
Elementary Aeronautical Science. *J. B. Hort & W. Laidler*.....$2.50
Elementary Laboratory Aerodynamics. *Arthur L. Jordon*.....80c
How to Fly. *Barrett Studley*.....$3
Manual of Flight. *Ienar E. Elm*.....$3
Practical Flight Training. *Lieut. Barrett Studley, U.S.N.*.....$5
Practical Flying. *Byron Q. Jones*.....$3
Simplified Aerodynamics. *Alexander Klemin*..$3.50
Skyways. *General William Mitchell*.....$3
The Airplane. *Frederick Bedell*.....$3
The Complete Airman. *Capt. G. C. Bailey*....$5

DESIGN, CONSTRUCTION, OPERATION

Aeroplanes, Seaplanes and Aero Engines. *Capt. P. H. Sumner*.....$4
Aircraft Float Design. *Holden C. Richardson, M.S.*.....$5
Airplane Mechanics' Rigging Handbook. *R. S. Hartz*.....$3.50
Airplane Pilot's Manual. *Ross Mahachek*.....$2.50
Airplane Welding. *J. B. Johnson, M.B.*.....$3.50
Airplane Structures. *Alfred S. Niles & Joseph S. Newell*.....$5
Marine Aircraft Design. *Wm. Munro*.....$4.50
Metal Aircraft Construction (revised edition). *M. Langley*.....$4.50
Oxy-Acetylene Welders' Handbook. *M. S. Hendricks*.....$3
Procedure Handbook of Arc Welding, Design & Practice.....$1.50
Screw Propellers (3rd Edition, 2 Vols.). *Chas. W. Dyson*.....$5

ENGINEERING

Aerodynamic Theory. *W. F. Durand*.....$7
Airplane Stress Analysis. *Alexander Klemin*..$7
Dynamics of Airplanes and Airplane Structure. *J. Younger & B. Woods*.....$3.50
Elements of Aerofoil and Airscrew Theory. *H. Glauert*.....$5.60
Engineering Aerodynamics. *W. S. Diehl*.....$7
Fundamentals for Fluid Dynamics for Aircraft Designers. *Dr. Munk*.....$8
Handbook of Aeronautics. *Royal Aeronautical Society*. Vol. 1.....$7.50
Principles of Aerodynamics. *Dr. Max M. Munk*.....$1.75
Principles of Flight. *Edward A. Stalker*.....$6
Simple Aerodynamics and the Airplane (4th revised edition). *Col. C. C. Carter*.....$4.50
Stresses in Aeroplane Structures. *H. B. Howard*.....$5

ENGINES

Aircraft Engine Instructor. *A. L. Dyke*.....$5
Aircraft Engine Mechanics Manual. *C. John Moors*.....$4.50
Aviation Engine Examiner. *Major V. W. Poge.*$3
Automohile and Aircraft Engines. *A. W. Judge.* (Revised).....$10
Aviation Chart. *Lt. V. W. Page*.....30c
Diesel Handbook. *Julius Rosbloom*.....$5
Engine Dynamics and Crankshaft Designs. *Glenn D. Angle*.....$4
Handbook of Aeronautics, *Vol.* 2.—Aero Engines, Design and Practice. *Alexander Swan*.....$4.50
High Speed Diesel Engines. *Arthur W. Judge.*$4
Modern Aviation Engines. *Victor W. Page* (2 volumes), *per volume*...$5
Set of 2 volumes.....$9
Modern Diesel Engine Practice. *Orville Adams*.....$6
Principles and Problems of Aircraft Engines. *Minor M. Farleigh*.....$3

FICTION

Night Flight. *A de St.-Exupery*.....$1.75
Sky Larking. Bruce Gould.....$2.50
The Right to Solo. *R. W. Kessler*.....$2
The Rise and Fall of Carol Banks. *E. W. Springs*.....$2.50
Wonder Book of Aircraft. *Harry Golding, F.R.G.S.*.....$2.75

GLIDERS

A B C of Gliding and Sailflying. *Maj. V. W. Page*....Cloth binding, $2; paper, $1
The Book of Gliders. *E. Teale*.....$1
Gliders and Gliding. *R. S. Barnaby*.....$3

Books make excellent Christmas Gifts

HISTORICAL

A Narrative History of Aviation. *John Goldstrom*.....$4
Beginning of Organized Air Power. *J. M. Spaight*.....$7
Evolution of the Flying Machine. Balloon: Airship: Aeroplane. *H. Horper*.....$5
Historic Airships. *R. Sargent-Holland*.....$4
Minute Epics of Flight. *Lumen Winter & Glenn Degner*.....$1
Sky High. *E. Hodgins & F. A. Mogoun*....$2.50
The Ingenious Dr. Franklin. *Nathan G. Goodman*.....$3
The Problem of Vertical Flight. *Parlee C. Grose*.....$1.50
Wings Over Poland. *Kenneth M. Murray*....$3

INSTRUMENTS

Blind Flight. *By Maj. Wm. C. Ocker & Lieut. Carl J. Crane*.....$3
Instrument Flying. *Howard Stark*.....$2
Measurement of Fluid Velocity and Pressure. *J. R. Pannell*.....$4

LANDING FIELDS AND AIRWAYS

Air Conquests. *W. J. Davis*.....$3

LEGAL AND MEDICAL

Aeronautical Law, with 1933 Supplement. *W. Jefferson Davis*.....$12.50
Aircraft and Commerce in War. *James M. Spaight*.....$2.25
Aircraft and the Law. *Harold L. Brown, LL.B.*$3
Aircraft Law—Made Plain. *George B. Logan, A.B., LL.B.*.....$3
Aviation Law. *Henry G. Hotchkiss*.....$7.50
Law of Aviation. *Rowland W. Fixel*.....$7.50
National Regulation of Aeronautics. *Chas. C. Rohlfing, Ph.D.*.....$3
The Law in Relation to Aircraft. *L. A. Wingfield, M.C., D.F.C., & R. D. Sparks, M.C.*.....$5
U. S. Aviation Reports, 1932.....$10
Aviation Medicine. *L. H. Bauer, M.D.*.....$7.50

MATERIALS

The Materials of Aircraft Construction. *F. T. Hill*.....$5
Manufacture and Use of Plywood and Glue. *B. C. Boulton*.....$2.25
Metallurgy of Aluminum and Aluminum Alloys. *Robert J. Anderson*.....$7.50
Engineering Materials (Volume I) Ferrous. *A. W. Judge*.....$8.50
Engineering Materials (Volume II) Non-Ferrous and Organic Materials. *A. W. Judge*..$7.50
Engineering Materials (Volume III) Theory and Testing of Materials. *A. W. Judge*....$6

MODEL AIRPLANES

Beginners' Book of Model Airplanes. *C. H. Claudy*.....$1.75
Building and Flying Model Aircraft. *Paul Edward Garber*.....$2.25
Complete Model Aircraft Manual. *Edwin T. Hamilton*.....$3.50
Miniature Aircraft. How to Make and Fly Them. *O. H. Day & T. Vincent*.....80c
Model Airplanes. *Joseph Ott*.....$2.50
Prize Winners' Book of Model Airplanes. *C. H. Claudy*.....$3
The Skycraft Book. *Laura B. Harney*.....$1.25

NAVIGATION AND METEOROLOGY

Aerial Navigation & Meteorology. *Lewis A. Yancey* (new edition).....$4
Aeronautical Meteorology. (Revised edition). *W. R. Gregg*.....$4.50
Aircraft Radio. *Myron F. Eddy*.....$4.50
Air Navigation and Meteorology. *Capt. Richard Duncan, M.C.*.....$3
Air Navigation for Private Owners. *F. A. Swoffer, M.B.E.*.....$2.25
Altitude & Azimuth Tables for Air & Sea Navigation. *Collins & Roden*.....$2
An Analysis of Meteorology. *Harold Lewis Kirby*.....$4
Avigation by Dead Reckoning. *Captain Ienar E. Elm*.....$2
Cloud Studies. *A. W. Claydon, N.A.*.....$4.50
Force of the Wind. *Herbert Chatley*.....$2
Line of Position Book. *Lt.-Com. Weems*....$2.50
Man and Weather. *Alexander McAdie*.....$2
Meteorology for Aviator and Layman. *Richard Whatham*.....$3
Navigation and Nautical Astronomy. *Capt. B. Dutton*.....$3.75
Simplified Aerial Navigation. *J. A. McMullen*.....$2
Simplified Time-Chart of the World. *Chas. M. Thomas*.....25c
The Navigation of Aircraft. *Logan C. Ramsey*.$4.50
The Navigation of the Air and Meteorology. *Capt. Leslie Potter*.....$4
Weather. *E. E. Free and Travis Hoke*.....$3
Weather and Why. *Capt. I. E. Elm*.....$2.50

PARACHUTES

Jump. *Don Glassman*.....$3
Parachute. *Charles J. V. Murphy*.....$2.50
Parachutes for Airmen. *Chas. Dixon*.....$2.50

PHOTOGRAPHY

Aerial Photographs. *Lt. Reeves, A.C.*.....$5
Airplane Photography. *H. B. Ives*.....$4
Applied Aerial Photography. *Capt. Ashley C. McKinley*.....$5
Multiple Lens Aerial Cameras in Mapping. *Fairchild Aerial Camera Corp.*.....$5

TRANSPORT & COMMERCIAL AVIATION

Economics of Air Mail Transportation. *P. T. David*.....$2
An Introduction to the Economics of Air Transportation. *Kennedy*.....$2
Principles of Transportation. *E. R. Johnson, G. G. Hubner and G. L. Wilson*.....$5
Transport Aviation (2nd Edition). *Archibald Black*.....$4

ELEMENTARY (GENERAL)

Dick Byrd—Air Explorer. *Green*.....$1.75
Everyman's Book of Flying. *Orville Kneen*..$3.50
Fighting the Flying Circus. *Capt. Eddie Rickenbacker*.....$2
Flying and How to Do It. *Assen Jordanoff*...$1
If You Want to Fly. *Alexander Klemin*.....$2.50
Riders of the Winds. *Edward Shenton*.....$2.50
Skycraft. *Augustus Post*.....$3.50
Skyward. *Commander Richard E. Byrd*.....$3.50
The First World Flight. *As related by the fliers themselves to Lowell Thomas*.....$5

YEAR BOOKS

All the World's Aircraft. 1933—*Jane's*.....$14.75
Junior Aircraft Year Book for 1934.....$1.50

Prices Include the Postage

AERO DIGEST • 515 Madison Avenue • New York

Remit by Money Order or Check

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

Fur Lined Aviators' Suits

(ONE PIECE COVERALL TYPE)

Entire suit lined with fur. Waterproof outer covering. Fur collar, double button flaps from crotch to neck. Perfect for duck and deer hunting, shooting and all outdoor sportswear. Built to last a lifetime. Warmest garment made. Sizes 38 to 44.

COST U. S. GOVERNMENT $78
OUR PRICE **$8.95**

Same as above with best rustproof "Hookless Talon" Zippers in front and legs.... **$11.95**

SPECIAL PRICES IN QUANTITIES

VALUES IN SLEEPING BAGS

"NORTHWOODS" Wool and cotton filling, soft brown drill lining..... **$8.25**

"NORTHWOODS SPECIAL" Same as above with longer zipper..... **$11.65**

"HOMESTEAD" Indoor sleeping bag, Kapok filling, soft cloth lining..... **$9.95**

"ESKIMO" Kapok filling, soft flannel lining, completely zippered..... **$19.95**

"EXECUTIVE" Kapok filled, 100% wool blanket lining. Most luxurious sleeping bag available. Adapted for all Seasons..... **$24.95**

MONEY BACK GUARANTEE
If in 10 days you are not entirely satisfied with any garment, we will refund your money.

Send 25% With Order. Balance C.O.D.

GOVERNMENT SURPLUS CORP.
89 GREENPOINT AVE., BROOKLYN, N. Y.
Tel. EVergreen 9-3710

---

50 BOOSTER MAGS @ $5
Oixie, overhauled, No. 132507. Real Buy.

RIEKER PITCH & BANK INDICATORS, $2.75
A useful and ornamental instrument.

JONES TACHOMETERS, new, $5
Parachute Harness for Irving, unused, $10 with all fittings for attachment.
J-5 Heater & Screen assembly, new, $12.
Specials for December only. Also, J-5 Parts; Wasp, Hornet, Cyclone; Tires, Wheels, Instruments, etc.

OYCER AIRPORT
9401 South Western Avenue Los Angeles, Calif.

SPECIAL WINTER HANGAR RATES

50 minutes express service from New York. 5 minutes from railroad station. 200 acre lighted airport; modern fireproof hangars.

Ask for our winter rates.

AIRVIEW FLYING SERVICE, INC.
Red Bank New Jersey

Landplane Airports, Seaplane Airports, Design, Supervision of Construction, Management Counsel, Transport Studies

A. P. TALIAFERRO, JR.* & COMPANY, INC.
Airport and Air-Transport Consultants and Engineers
101 PARK AVENUE, NEW YORK
*Formerly Chief of Airport Section, U. S. Department of Commerce, Washington.

MAX M. MUNK

Registered Patent Attorney

Grad. Mech. Engineer
Doctor of Engineering
Ph.D.
Member Virginia Bar
Technical Author

Rendering professional service of highest standard to government and private parties here and abroad since 1915.

1734 Eye St., N. W. Washington, D. C.

Royal E. Burnham

Attorney-at-Law

Patent and Trade Mark Causes

511 Eleventh St., N.W., Washington, D.C.

---

selected clear aero sitka

SPRUCE

For quick shipment from Chicago, rough or finished to exact size. For airplanes, gliders, iceboats, etc.

Lowest Wholesale Prices

Have specialized in high grade spruce for many years. All our spruce aero stock comes from finest old-growth spruce on Pacific Coast. Manufactured, selected and packed with utmost care; shipped promptly. We are largest and oldest company in Central West specializing in high grade spruce. Carry big stock for special industrial trade. When you buy spruce for a plane or glider you want the best. Don't take a chance on questionable quality.

Come to Us for Good Spruce

PIKE-DIAL LUMBER CO.
Airplane Lumber Specialists—2251 Loomis St., Chicago

ENGINE PARTS

Kinner — J-5 — J-6 — Velie — Cirrus —Warner—Gipsy

Valves, Pistons, Heads, Barrels, Rods, Bushings, Magnetos, Cases, Carburetors, Shafts, Pins, Tappets, Etc.

Complete lists for above engines

Instruments, tires, wheels, propellers at discounts

Get Our Prices First

CAMDEN AIR SUPPLIES
6307-09 Westfield Ave. Merchantville, N. J.

San Fernando & Raymond - - - Glendale, Calif.
LIEUT. W. B. HAWKINS

AIR-PARTS 70-85% OFF

A DEPENDABLE COMPANY

All parts for Wasp, J-6, J-5, Challenger, Lycoming, Warner, Kinner, Axelson, Siemens, Velie, LeBlond, Cirrus, Gipsy, Comet, Szekely. All merchandise reconditioned. Shipped on subject-inspection basis. Largest stock reconditioned parts on Pacific Coast.

INVENTORS

Time counts in applying for patents. Don't risk delay in protecting your ideas. Write for FREE book, "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. My success built upon strength of satisfactory service to inventors located in every State in the Union.

Clarence A. O'Brien, Registered Patent Attorney,
3147 Adams Building, Washington, D. C.

SEA AND AIR NAVIGATION

Instruction and Equipment

CHARTS, MAPS, SPECIAL RESEARCH

Gold Medal Textbook, Air Navigation.	$5.00
Line of Position Book.....	2.50
Star Altitude Curves (10 deg. latitude)	5.00
Dead Reckoner (for Aviators).....	2.00
Aircraft Plotter	5.00
Folding Chart Board	3.00
Second Setting Navigation Watches...	80.00
Ditto, Lindbergh Model.....	150.00
Gatty Ground Speed and Drift Meter..	350.00
Bureau of Standards Type Sextant....	575.00
Government Maps	List price
Home Study Courses.....	100.00

Other Books, Equipment, Maps, etc., as Ordered

WRITE FOR DETAILS

Weems System of Navigation

Annapolis, Maryland, U. S. A.

KINNER PARTS

VALVES—GUIDES—CAMS—PISTONS
MAGS—STACKS—AND SMALL PARTS

A small stock of NEW Parts honght at Bargain Prices and offered to our customers at BIG SAVINGS.

Write or wire

SUPPLY DIVISION, INC., Robertson, Mo.

A COMPLETE LINE

TITANINE

THE WORLD'S PREMIER

DOPE

TITANINE, INC.
MORRIS & ELMWOOD AVES.
Union, Union Co., N. J.

AIRPLANE ENGINES

PRE-INVENTORY SALE

20 Rebuilt Curtiss OX-5's.....	$48 each
12 Rebuilt Hisso A's	72 each
12 Rebuilt Hisso E's	96 each

Write for complete description

Machine work on all types of engines, including cylinder regrinding, valve guides, valve inserts, bearings rehabbitted and special machine work.

HECKMAN MACHINE WORKS, INC.
Aeronautical Machinists
4026 W. Lake St. Chicago, Ill.

FOR SALE

MISCELLANEOUS
46 Airplanes
28 Engines
Lights—landing, navigation
Fuel Pumps
Generators G1-G2
Oil and Fuel Line Fittings
Oil Reclaimers
Safes
Instruments
Starters and Parts
Propellers and Parts
Plywood (3-Ply Birch)
Goodyear Airwheel Parts

PARACHUTES
Aircraft Cable
Radio Receivers
Radio Parts R.C.A., W.E., S.C.
Tools and Shop Equipment

AIRPLANE PARTS
Stinson Parts—
Models "S" Jr., SM1-D, SM6-B, SM6000-B
Ford Airplane Parts—
5 AT
Fokker Parts—
S.U. and F10A
Travelair Parts—
(Model 4000)
Stearman Parts—
(C3B-C3MB-4CM1-LT1)
Pitcairn Parts—
(PA3-6-7)
Fairchild Parts—
(FC2-FC2W2-71)
Bellanca Pacemaker Parts
Pilgrim Parts—
(100A and 100B)

ENGINE PARTS
Wright Engine Parts—
J-6-5, 7, 9 and J-5 Cyclone E, Gypsy
P & W Engine Parts
Wasp B & C—Wasp Jr.
Hornet A-A1-A2-B-B1-C
Kinner Engine Parts—
K5-B5-C5
Ignition Harness
Shielded and Unshielded
Spark Plugs
Magnetos and Parts
Carburetors and Parts

This is not a complete list. Additional equipment is being constantly received.
Descriptive price lists mailed immediately upon request covering class of stock in which you are interested.
Reasonable prices. New engine parts 50% off list—used parts 80% off list.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED
Please order by part number where possible

American Airways, Inc., Sales Div., Cleveland Airport, Cleveland, Ohio

BUYERS' DIRECTORY

$9.00 PER INCH. PAYABLE IN ADVANCE.

STREAMLINES
Cowlings and Wheel Pants
Metal Spinning, Sheet Metal Specialties
HILL AIRCRAFT STREAMLINERS CO.
814-16 Reedy St. Cincinnati, Ohio

AVIATION SALVAGE CO.
6205 South Menard Ave., Chicago, Ill.
Telephone: Hemlock 9105
WE BUY AND SELL
high grade, reconditioned aircraft engines, instruments and accessories.
All guaranteed to be in good condition
Prompt attention given every order and inquiry. Let us make you an offer on the parts you wish to sell
Write or wire for price list

AERO ENGINES
Parts and Accessories Bought and Sold
Parts of all engines 50 to 80% off list. Also complete engines—overhauled and in need of overhaul; generators, control boxes, starters, instruments, flares, wheels, propellers, parachutes. Lambert and American Cirrus engines complete. Bank and turn, rate of climb, $40 each. Artificial horizon and directional gyro cheap. 2 Irvin chutes $90 each. Write or wire
W. K. Jaros
AIRCRAFT SALVAGE COMPANY
48-03 Oitmars Blvd., Astoria, L. I., N. Y.

COME AND GET 'EM
COMPLETE stock of guaranteed brand new factory parts for Pitcairn PA-6 and 7 Mailwings. Wings, tails, fuselages, engine mounts, landing gears, control cables, cowlings, fittings, etc.
Also complete stock of new and used factory parts for Keystone-Loening Commuters. Misc. parts for SM8A Stinson.
BASIL AVIATION COMPANY
Philadelphia Municipal Airport Philadelphia, Penna.

DEPENDABILITY ACCURACY Speed
UNIVERSAL PROPELLERS
UNIVERSAL AIRCRAFT S.CO., ST. LOUIS

STAINLESS STEEL TIPPED PROPELLERS
FLOTTORP PROPELLER CO.
1836 Linden Ave., S. E.
Grand Rapids, Michigan

AERONAUTICAL RADIO CO
ROOSEVELT FIELD MINEOLA N. Y.
Telephone: Garden City 6770
Complete stock all types aircraft radio equipment. Several used Lear, R.C.A. and Westport direct and remote control sets on hand. Latest models; guaranteed.

A Good Idea!
SEE PAGE 54 THIS ISSUE

BOWLUS-DUPONT SAILPLANES
Complete A.T.C. Blueprints now available for famous "Albatross II."
Write for particulars
Bowlus-duPont Sailplane, Inc.
Wilmington, Delaware

N. A. C. A. Cowling Specialists
METAL SPINNERS
for
LEADING AIRCRAFT BUILDERS
We can spin blanks 90 inch diameter
MAGOSY & BUSCHER
120-126 Walker Street, New York, N.Y.

AVIATION!
APPRENTICESHIPS
AIR-MINDED Young Men interested in entering the field of Aviation as Apprentices. Write, enclosing stamp, to
MECHANIX-UNIVERSAL AVIATION SERVICE
13291 Ardmore Dept. C. Detroit, Mich.

FOR SALE — LOWEST PRICE
Warner Cessna; new Robin right wing; left lower Fledgling wing; Fledgling oleo; Warner parts, new and used; OX parts, new and used; Stromberg carburetor for Challenger; Pyle-National landing lights; many other parts.
Complete list with prices on request
SERV-AIR, INC.
Raleigh Municipal Airport, Raleigh, N. C.

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

Sacrifice Sale: Certified Used Ships
WACO MODELS A, F, F-2, C. Many extras. Trade or terms to responsible parties.
WACO SALES
OF NEW YORK, INC.
Hangar 16, Roosevelt Field, Mineola, N. Y.
N. Y. Phone: Vigilant 4-5317 Field: Garden City 5313

ENGINE BROKERS
Hangar "B," Roosevelt Field, Mineola, N. Y.
FOR SALE OR EXCHANGE: Completely overhauled Wasp A—B—C—S1D1—Wright J-5 and J6-5-9 cylinder A and D types—Continental 165—Challenger and Kinners.
FOR SALE: ONE ROBIN WING, NEW, RIGHT
Parts and Accessories Bought and Sold
Don Walling Wm. Wieland

CHALLENGER ENGINES, NEW.....$500
Challenger Engines, overhauled, $200 & up
Complete stock of new and reconditioned Challenger parts on hand. Lycoming Engine, R-680, just major overhauled, $500. New Bendix wheels, 30 x 5, with brake assemblies, $22.50. Steel propeller for OX or Warner 110, $60.
Write or wire when in need of supplies
AVIATION ASSOCIATES, INC.
Curtiss Airport East St. Louis, Ill.

AIRPLANES FOR SALE
Available for Immediate Delivery

12 Wasp Fords	Chicago	(Quotations upon request)
13 Lycoming Stinson Trimotors	Big Spring, Cleveland, Tulsa, Dallas, Nashville, Detroit	$4,500 to $5,500
12 P & W Hornet Pilgrims	Tulsa, St. Louis, Detroit, Ft. Worth	8,500
4 Wright Cyclone R 1820 E Pilgrims	Cleveland, Albany, St. Louis	8,500
1 S-38-C Sikorsky Amphibian	Cleveland	11,500
3 Model "U" Stinson Trimotors	Cleveland	8,000
1 Wright J-6-9 Stearman 4CM1	Cleveland	5,000

THIS AIRCRAFT Is in excellent condition, being withdrawn from service on our lines to be replaced with faster equipment.
Our quotation includes newly overhauled engines installed O.O.F. Chicago.
CASH OFFERS are requested to include newly overhauled engines installed and "NC" License.
In the event of export, all such shipments of aircraft will be covered by Export Airworthiness Certificates.
UPON REQUEST we will quote C.I.F. any desired Seaport or O.O.F. where now located.
Photographs to responsible buyers.

ALL BONA FIDE CASH OFFERS WILL BE CAREFULLY CONSIDERED

American Airways, Inc., Sales Div., Municipal Airport, Cleveland, Ohio
Branch Office—Sales Division, 45 Vanderbilt Ave., New York City

FOR SALE
HIGH CLASS USED AIRPLANES
Sales WACO AIRPLANES Service
Govt. Approved Flying School • Govt. Approved Repair Station • Charter Service
This is the time of year to have your ship rebuilt. Our prices are the lowest.
All work guaranteed
Consult us before going elsewhere
Free estimates
ERICKSON & REMMERT, Inc.
Hangar 6, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-2100

PLANES AND ENGINES

$9.00 PER INCH. PAYABLE IN ADVANCE.

WACO 1933 CABIN
• A real buy •

Continental 210 Engine, just completely top overhauled.

R.C.A. RADIO

Full Instrument Board, including

SPERRY GYRO COMPASS
KOLLSMAN SENSITIVE ALTIMETER

SPECIAL PAINT JOB

70 gallon Gas Tanks—4½ hours cruising at 125 m.p.h.

A buy at $3,900 net
AT ANY EASTERN AIRPORT
Write or wire
AERO DIGEST — BOX 1920

ENGINES

PARTS AND ACCESSORIES BOUGHT—SOLD
Parts for Wright, P. & W., Lycoming, Kinner, Warner, Continental, Lambert, LeBlond, Szekely, Cirrus, Gipsy, Challenger, Genet, Salmson, Menasco, etc. Also starters, generators, propellers, instruments, wheels and parachutes.
WRITE FOR PRICE LIST FRANK AMBROSE
AERO SALVAGE CORP.
Glenn Curtiss Airport, Jackson Heights, N. Y.

BETTER AIRPLANES FOR LESS

Alexander Flyabout, Szekely 45, 2 PCLM.....	$650
Bach Trimotor, 1 Wasp, 2 new J6-7 E Engines, excellent condition .....Make offer	
Bellanca Skyrocket, Wasp, perfect.....	6,750
Bellanca Pacemaker, J-6, recovered, overhauled.	5,500
Fleet, Model 2, overhauled K-5 motor.....	1,275
Lockheed Vega, Wasp, absolutely perfect.....	10,500
Monocoupe, Velie, Long wing, recovered.....	700
Monocoupe, Velie, very good.....	575
Sikorsky S-39, disassembled; all parts available	
Stinson Sm-7B, Wasp Jr., 280 hrs. total.....	3,000
Stinson "S," Lycoming, cowling ring, etc.....	1,950
Stearman, J-5, excellent condition.....	1,600
Travel Air monoplane, J-6, perfect.....	2,200
Travel Air monoplane, J-6, very good.....	1,950
Travel Air, Challenger 185, airwheels, etc.....	950
Wallace Touroplane, Kinner K-5, 3 PCLM.....	975

We are now handling a complete line of new WACO airplanes.

Write for details on any of the above listed airplanes, and for our NEW BULLETIN covering our complete stock of new and used engines, engine parts, propellers and all types aviation equipment.

AERO BROKERAGE SERVICE COMPANY
E. L. ERICKSON
LOS ANGELES AIRPORT - INGLEWOOD, CALIFORNIA
"Selling the World Over"

BIRD: 4-place, 125 Kinner
PRIVATEER Warner
WACO Cabin, 165 Continental
STINSON Lycoming
SPECIAL LAIRD, Wasp 420

HOEY AIR SERVICES
Hangar No. 3, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-4200

DETROIT AERO MOTORS CO.

14019 Hamilton Ave. Highland Park, Mich.

FOR SALE—AIRCRAFT ENGINES: 1 late type 45 h.p. Szekely, $250; Continental A70-1, 165 h.p., $350; Continental A70-2, 165 h.p., $450; J6-5, 165 h.p., $350; J-5's, 220 h.p., $400; J-4, $150; Wright Cyclone, Model E, 22 hrs. since major, complete with Standard Steel propeller and electric inertia starter, $650; 45 h.p. air-cooled motor, $65; 8.50 x 10 wheels, tires, tubes, and brakes, $85 per set.

WE BUY AND SELL AIRCRAFT ENGINES

PACKARD	800 H.P.
PACKARD	500 H.P.
LIBERTY	400 H.P.
HISPANO E	180 H.P.

Engines and Spare Parts for Sale

The Vimalert Company, Ltd.
835 Garfield Avenue, Jersey City, N. J.

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

AERONAUTICAL ENGINEERING
DEGREE IN 2 YEARS

Become an Aeronautical Engineer. Tri-State College course given in 108 weeks. Bachelor of Science degree. Graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Thorough training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Non-essentials eliminated. Courses designed to save student time and money. Flying school facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter September, January, March, June. Courses are offered also in Civil, Architectural, Electrical, Mechanical, Chemical, Radio Engineering; Business Administration and Accounting. Living costs and tuition low. Those who lack high school may make up work. World famous for technical 2-year courses. Graduates successful. Write for catalog.

10124 COLLEGE AVE., ANGOLA, IND.

TRI-STATE COLLEGE

AERONAUTICS
at STEWART TECH

Thorough—Technical and Practical Training Under Specialists. Complete Equipment—Large Workshops—Live Engine Testing Under Actual Flight Conditions. Master Mechanic and Aeronautical Engineering Courses.

25 YEARS experience in training men for successful careers in the field of mechanics. Graduates qualified for government license. Visit the school or write for new Catalog.

STEWART TECH SCHOOL
Dept. 834M 253-5-7 W. 64th St. New York City

STUDENTS

As you become better acquainted with the aviation industry you will find that the majority of the aviation workers who have entered the industry in recent years are graduates of the schools who advertise in AERO DIGEST.

The industry watches the better grade of schools very carefully, for they know that they are their future source of well-trained employees.

Keep an eye on your future, study the schools carefully—what they have in the way of equipment, who are their instructors, what is their experience—choose carefully, if you would make the most of what aviation has to offer.

LEARN FLYING
IN AN APPROVED SCHOOL

• • Instructors, ships, facilities and field are approved by the United States Department of Commerce only after rigorous examination.

Ground and flying instruction is based on a regular schedule—arranged to assure maximum results in a minimum of time.

Students qualify for Department of Commerce licenses with less flying time—a saving in costs.

Write for Complete Details and Costs

INTER CITY AIRLINES, Inc.
BOSTON MUNICIPAL AIRPORT EAST BOSTON, MASS.
Operating the Only Approved Flying School in New England

AVIATION SCHOOLS

$9.00 PER INCH. PAYABLE IN ADVANCE.

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS

Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering.

NEW YORK UNIVERSITY
UNIVERSITY HEIGHTS, NEW YORK, N. Y.

LEARN TO FLY AT
THE FINEST AIRPORT IN THE EAST

Up-to-date Equipment
Amateur Pilot's Course, $390; Private, $585
Including ground school courses

Erickson & Remmert, Inc.

Approved Flying School
Hangar 6, Floyd Bennett Field, Brooklyn, N. Y.
Telephone: Nightingale 4-2100

Amateur Course.....$185
40 actual flying hours; 10 hours X-country
Private Course.....$265
65 actual flying hours; 15 hours X-country

Stinson Airport School of Flying

One of the oldest established flying schools in the middle west

Joliet Road (U. S. No. 66) La Grange, Ill.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

PLANES AND ENGINES FOR SALE

TAYLOR CUB: Continental A-40; 167 hours total. Licensed until December 1, 1935. Manufactured November 1932. Motor just overhauled. $795. A. G. Becker, Dravosburg, Pennsylvania.

OX WACO 10: $500. OX Challenger, $550. Both licensed, in excellent condition. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

FOR IMMEDIATE SALE OR EXCHANGE: 9 certified airplanes, as follows: J6-9 330 h.p. 6-place Stinson cabin ship, witb air wheels; J-5 B-1 5-place Ryan cahin ship; J6-5 175 h.p., 3-place Curtiss Robin cahin ship; J-5 3-place Travel Air, late type; J6-9 330 h.p. Straight Wing Waco; J-5 Waco; J6-7 250 h.p. Straight Wing Waco; OX-5 Waco 90; OX-5 Travel Air. All sbips in excellent condition throughout. Will accept good late model cars on deals. Terms to responsihle buyers. Becker-Forner Flying Service, Inc., Jackson, Michigan.

ENGINES: Two J6-5 Wrights, perfect shape, 97 hours on each; complete witb carburetor and mags, $550 each. One Challenger with 60 hours, complete with carhuretor and mags. All motors have valves ground, checked and inspected. Challenger price, $225. Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

AERONCA SEAPLANE: On floats. 3 months old. 185 hours. Motor just overhauled; condition like new. Located in New York. AERO DIGEST, Box 1934.

FOR SALE: American Eagle, 100 h.p. Kinner, new type head, Model A-29, completely refinished the past 30 days; always hangared and recently relicensed. Price $850. Galveston Flying Service, Inc., Municipal Airport, Galveston, Texas.

LICENSED 1934 D-145 Warner Monocoupe: Standard equipment plus special black and white paint job, oil radiator, climh and descent, turn and hank, 8-day Waltbam clock. Total time on ship and engine, 25 hours. Will sell at bargain for casb. C. G. Hill, Box 2101, Winston-Salem, North Carolina.

FOR SALE: One B-5 Kinner engine, 125 h.p., practically new. Can be seen at residence of Earle Eckel, Washington, New Jersey.

FIVE-PLACE J-5 Fairchild Cabin: Licensed. Excellent condition. Completely equipped with instruments. Bargain for quick sale. Mrs. Montrose Tull, Jr., Chapel Hill, North Carolina.

J-5 STANDARD for sale: Motor 200 hours, ship 1100 hours total. 400 hours on ship since complete rehuilding. High gloss finisb. Air speed, turn and hank, rate of climh, besides standard instruments, and tail wheel. Good shape all around. Never cracked. Price $1900 cash, or will trade for good four-place cabin job. Cessna preferred. Ed. Nibur, Madeira Airport, Reading, Pennsylvania.

SALE OR TRADE: Air King, incomplete. Marine converted Hall-Scott. 16-foot outboard, ½ electric motor. Frank Atamanchuk, 403 River Road, North Arlington, New Jersey.

SELL OR TRADE: Two Waco 10's; licensed August, 1935. Excellent condition. $350 eacb; or trade for cahin plane. United Flyers Co., Box 176, La Crosse, Wisconsin.

J-5 NEW STANDARD: 160 hours since overhaul; steel prop, oversized tires, set brakes, tail wheel. Licensed June, '35. A real good looking ship. $1800. Edward H. Spooner, Claremont Airport, Claremont, New Hampshire.

FOR SALE: To settle estate: Lycoming Stinson SM8A on Edo floats, witb landing gear, night and blind flying equipment. Four-place Kinner Bird on Edo floats, landing gear and air wheels. J-5 Stearman, new Edo floats, special landing gear, speed ring. These planes in perfect condition and must he sold. All offers carefully considered. AERO DIGEST, Box 1921.

TRIMOTOR LYCOMING STINSON: Model T. Licensed 10 passengers and pilot, completely equipped for night flying; lavatory, air wheels, new hydraulic brakes, spare tire and tube. Selling price, $3,500; can finance approximately 40% for responsible party. Will consider trade. Lycoming Motor: New style crank sbaft. Time since overhauled, 213 hours. $400. Curtiss Fledgling: Excellent condition; recently recovered. Safest training plane available. $900. John T. Corrodi, Inc., Box 185, Bexley Station, Columhus. Ohio.

AVRO AVIAN crack-up: Ideal for person wanting to huild up ship during winter; motor perfect. $135. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

FOR CASH SALE: Completely rebuilt Aeronca E-107-A motor. New cylinder assemblies. No bours since rebuilding. Can make attractive offer. Write for full particulars. AERO DIGEST, Box 1922.

FOR SALE OR TRADE: NB-3 Barling, 88 h.p. Genet motor; air wheels, 3-place, duals, 240 hours, licensed to November 15, 1935; never cracked. $650. Paul B. Eaton, Charlotte, N. C.

FOR SALE: Inland Sport, LeBlond 65. A-1 condition. Licensed to Sept. 1, 1935. $750 cash, accept Lambert 90 motor in trade. R. N. Laner, Neodesha, Kansas.

ARISTOCRAT J6-5: Economical for cross-country work. Cruises 110 m.p.h. Excellent for building up time. 30 bours since rebuild, recover job. Perfect condition, $1,200. Edna Gardner, Naval Hospital, Washington, D. C.

FORD TRIMOTOR J-5: 14-place, $2,850. Standard J-5: 5-place, $1,450. Planes in perfect condition. Jess Bristow, 2103 Columbus Street, Fort Worth, Texas.

CURTISS-WRIGHT JR.: Excellent condition; relicensed in August. New propeller, engine reinforced, navigation lights, $325. Thomas Davis, 16 N. Richards Ave., Atlantic City, N. J.

OX-5 COMMAND-AIRE: Just relicensed for one year. Millerized; Scintilla Magneto; excellent condition, ready to go at no additional expense. Sacrifice, $450. Must sell! Gordon Dahlberg, 2365 Glencoe Street, Denver, Colorado.

GREAT LAKES: Hamilton steel propeller, convertible front cockpit, compass, air speed meter, special paint job, semi-air wheels. 106 hours on motor since major overhaul. Licensed to August, 1935. $750. Two parachutes, $75 each. A. W. Newberry, 911 Equitable Building, Denver, Colorado.

REPOSSESSED TRAVEL AIR: Millerized OX-5; licensed until Sept., 1935, duals, responsible party can buy it $150 down, balance monthly. Pioneer Finance Dept., Airport, Syracuse, N. Y.

AERONCA C-2: Licensed; recently recovered; engine overhauled; color red and silver; privately owned. Must sell. A. Stamm, c/o Perel and Lowenstein, 19 N. Main, Memphis, Tenn.

4-PLACE 185 H.P. Challenger Rohin: Bendix wheels and brakes. Licensed to May, 1935. A hargain at $950. Marlboro Airport, Marlboro, Massachusetts.

BIRD, B-5 KINNER: Three-place, dual instruments and brakes front cockpit. Air starter, steel propeller, lights with Exide battery. Ship and motor completely rehuilt in June. Licensed to July, 1935. Will consider taking in trade Aeronca, Taylor Cub or Monocoupe. Also have for sale J6-7 Waco, Mead primary glider with automobile trailer. Airport, Natick, Mass.

AERONCA C-2: $350. Airplane has 190 hours, motor less than 70. Good condition; uses less than two gallons gas per hour. Just relicensed. M. Jansen, Teterhoro Airport, Hashrouck Heights, New Jersey.

TRAVEL AIR J-5 4000: Goodyear Airwheels, navigation lights, steel propeller, brakes, turn bank, rate of climh, compass, air speed, altimeter, clock; licensed until September next year; sell or exchange. Harley Miethe, Georgetown, Illinois.

WACO F, KINNER 125: Fine condition, never cracked. Privately owned, always hangared. Take in trade Chevrolet or Plymouth or late Waco Cabin. Box 127, Mullens, West Virginia.

WACO NINE: Millerized OX-5, A-1 condition. Licensed to May, 1935. Extra OX-5 parts with ship at $450. New skis for ship. L. D. Rueb, Newport, New Hampshire.

FOR SALE: One J-6 Ford, one Skyrocket Bellanca, two J-6 Bellancas, one Sikorsky 38, one 71 Fairchild. All perfect condition. AERO DIGEST, Box 1935.

FOR SALE: J6-9 330 h.p. 6-place Stinson cabin ship. Excellent condition throughout. No reasonable offer or proposition refused. Terms to responsihle huyers. Michigan Aero Motors, Jackson, Michigan.

TRAVEL AIR J6-5: Model E-4000; 690 hours on ship, 190 on motor; in perfect shape; steel prop, air speed, compass, Bendix wheels and brakes. Licensed until Octoher, 1935. Recovered short while ago. No trades; priced for quick cash sale, $1,350. Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

FOR SALE: Upright Cirrus III 90 h.p. motor, A-1 condition; or will exchange for Kinner parts or complete motor, 100 h.p. Ken Morey, Adrian, Michigan.

HUNDREDS OF USED PLANES: Crack-ups, parachutes. OX johs, $90 up. Send 20c for Directory containing owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

WARNER CESSNA: 4-place, Hamilton steel propeller, speed ring, semi-air wheels, brakes, pants, tail wheel. Special white finish, orange striping on fuselage. Beautiful job, in A-1 condition; $1,200. J. R. James, 235 Berteau Ave., Elmhurst, Illinois.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

● PLANES AND ENGINES FOR SALE

WARNER FLEET: Best huy in conntry. Not flown since major overhauled throughout. New wings, new covering, new prop, airwheels, motor majored. Just like new, $1,250. Alton Walker, Western Airplane Distrihutors, Graphic Arts Building, Kansas City, Missouri.

AERONCA: Two-place, year old, 190 hours; especially covered for show purposes. Had excellent care, looks like new. H. B. Kaywood, 169 Avondale Avenue, Jackson, Michigan.

TWO FLEETS: Late Kinner K-5's, recently licensed. $1,025 and $1,250. Also Curtiss Fledgling and Taylor Cuh, excellent condition and priced to sell. Two good Irvings at $65. Meinke-Eldred Flying Service, Willoughhy, Ohio.

WARNER FLEET: 700 hours; motor just overhauled; fahric excellent condition; never cracked; price $1,500 cash. Will fly anywhere if guaranteed expenses of trip. AERO DIGEST, Box 1932.

LATE 1933 WACO: Cahin, 100 hours, excellent condition, electric starter, lights, flares, special instruments. Accept 210 Waco F-2 or F-3 part payment. AERO DIGEST, Box 1929.

SALMSON EAGLET: Like new. Enclosed like a Rearwin. Only 190 hours total time. Bought new from factory July 1933. Always hangared. In hangar now on Fowler Airport. $600 cash. Reason for selling, buying larger ship. F. W. Bower, c/o Bower Show Print, Fowler, Indiana.

WACO: Siemens 125 h.p. radial, 9-cylinder. Ship and motor condition perfect. Airwheels, steel propeller, collector ring, navigation lights, etc. Motor 200 hours; just overhauled; extra motor. Ship 520 hours, covering new. Very economical; motor extremely smooth, quiet and dependable. Price $995. Will consider popular light car or ship in trade. I. Walter Sell, 566 Vine Street, Johnstown, Pennsylvania.

CHALLENGER COMMAND-AIRE: 185 h.p. Excellent; 500 hours, no time since major; starter, extras. Bargain for cash; light ship accepted part trade. Jack Spencer, Grand Haven, Mich.

$750 BUYS Challenger Rohin: Just relicensed for year. Ship just refinished, Army yellow. Also Edo Pontoons, complete, for Challenger Rohin, $400. C. W. Siehl, Sherhurn, Minnesota.

FORD TRIMOTOR: J6-9 motors. Total time 900 hours. Beautiful condition; many extras. $5,500. Russell Lohe chute, never jumped, $50. J. Wood, 1238 N. Lomhard Ave., Oak Park, Ill.

WARNER CESSNA: Licensed till July; less engine, $595. J-5 Cessna; Licensed, Airwheels, $900. Warner engine, just majored, $395. Approved Warner steel prop, like new, $95. Warner cylinders, new type, $30. Exchange, $22, early type, $15. Merle Buck, Onalaska, Wisc.

REARWIN JR.: Szekely 45 h.p., Airwheels. Just overhauled and relicensed to Novemher 1935. $550. Will take light car on trade. Keith Marsh, Humholdt, Iowa.

AERONCAS: Used two-place trade-ins, ranging in price from $850 to $1,250. For details, write immediately to Aeronautical Corporation of America, Cincinnati, Ohio.

WARNER ARISTOCRAT: Good condition, motor had 150 hours since major; 10 hours since top overhaul. $875. John T. Corrodi, Box 185, Bexley Station, Columhus, Ohio.

STEARMAN C3R: with J6-7, $1,650. Also Waco A, with Warner 125 and winter enclosure. Both owned hy sportsmen and have many extras. Must sell Now. Meinke-Eldred Flying Service, Willoughhy, Ohio.

MONOCOUPE VELIE: 275 hours total. Manufactured 1931. Very good condition. Licensed until Decemher 1935. Priced for quick sale at $575. A. G. Becker, Dravoshurg, Pennsylvania.

PITCAIRN MAILWING, $1,450. J-5 Travel Air, $1,100. Warner Stinson Jr., $750. Siemens-Halske Cessna, $750. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

FOR SALE AT BARGAIN: Lycoming Stinson Reliant. Latest model. Purchased new July 10th. Leather upholstering; equipped for night flying. Also equipped with Speed Arresters and honded for Radio. A heautiful ship. Flown less than 50 hours. Edw. A. Forner, Jackson, Mich.

PRIVATE OWNED: Waco C, J6-5 Travel Air, Lamhert Monocoupe, Stinson S, Waco F, OX Bird, OXX-6 Waco. These airplanes must be sold. Pioneer Aviation, Airport, Syracuse, New York.

SPECIAL ARISTOCRAT: 3PCLM; completely modernized Wright J-6, 175 h.p.; fully equipped, including leather upholstery, complete Pioneer instrument hoard, speed ring, semi-halloon wheels, pants and fairing on all struts and fittings. 300 hours total. Price $1,600; will trade. R. F. Hoey, Hangar 6, Floyd Bennett Field, Brooklyn, New York.

WARNER WACO F in excellent condition. Licensed until Septemher, 1935. A real hargain at $1,250. OX Rohin, licensed until Novemher, 1935; Millerized and in new condition, $450. Curtiss Thrush: six-place, J6-7; ship and motor recently overhauled. Starter and extra instruments. $1,750. The Little-Greiner Flying Service, Springfield, Ohio.

MONOCOACH: 4-place cahin, J-5; full night flying equipment; hoth plane and engine in excellent condition; licensed; $1,350. Hisso Eaglerock, licensed, $450. OX Rohin, licensed May, 1935, $495. These are some of our hargains. Write us if you want to huy or sell. Aviation Associates, Inc., Curtiss Airport, East St. Louis, Illinois.

WACO C: Late model, Cadillac green. Flares, landing lights, hank and turn, rate of climh, steel prop, pants, Westport radio; heautiful ship; less than 100 hours certified time. Must sacrifice. H. W. Bresee, 650 S. Salina St., Syracuse, New York.

LINCOLN KINNER K-5: in good condition, $675. Fred Scharrer, 2917 Prospect Avenue, Peoria, Illinois.

TRAVEL AIR 6000: Equipped with two-way radio, landing lights, flares, extra instruments. Powered with Wright E motor recently overhauled. Wonderful plane and motor. Must sacrifice. Wire your offers. Barney Burnham, Municipal Airport, Omaha, Nehraska.

FOR SALE: Aeronca Collegian two-place cahin. New April first this year. Never heen cracked. Total time 314 hours. Extra equipment includes pants, Pioneer instruments and special paint. Licensed to February 15, 1935. Priced for quick sale. No trades considered. Jack Gillies, Aviation Country Cluh, Hicksville, L. I., N. Y. Hicksville 1013.

FLEET: Kinner K-5. Completely rehuilt May, 1934; full sized air wheels, hrakes, Eclipse air starter; leather upholstery; steel propeller. Must he seen to he appreciated. $1,500. Lowell White, Caldwell-Wright Airport, Caldwell, N. J. Phone Caldwell 6-1560.

BIRD OX-5: 365 hours, $500. Swallow TP, 215 hours; Millers, Scintilla, $350. Both just relicensed. Art LaViolette, 7337 S. Honore St., Chicago, Illinois.

WACO: UEC 4-PLACE CABIN: Late 1932, powered with Continental 210 h.p. Ship and motor perfect with only 400 hours. Motor just majored and modernized, with no time since. Plane fully equipped with steel propeller, Lear radio, electric flares, landing lights, air starter, clock, rate climh, hank and turn, air speed, compass, new tires and tuhes, special red upholstering. Colors are intense hlack fuselage with red stripe, gold wings, chromium plated struts. Ship now on land gear, also has Edo No. 3300 floats with struts, fittings and rudders, all in perfect shape with little time on them. A DeLuxe ship at ordinary ship price. Original cost well over $8,500. Just the plane for firm or individual who wants perfect ship, fully equipped for land or water use. 70 gal. gas tanks; licensed to July 1, 1935. Special price with float installation, $4,250; price less floats, $3,750. Phone, write or wire Midwest Airways, Inc., Box 147, Cudahy, Wisconsin.

AEROMARINE KLEMM: $395. Curtiss Junior: $295. Chest, hack expedition parachutes, $95; will trade. Wanted: Any Aeronca engine; and ship parts. Northeast Philadelphia Airport, Philadelphia, Pennsylvania.

MONOCOUPE: Velie 65. Just recovered. Licensed to May 1, 1935. Beautifully finished in Stearman vermilion and aluminum. $590. Richard Riedel, 936 Lansing Ave., Austin, Minnesota.

FOR SALE OR TRADE: Waco 10, OX-5, licensed, good condition, steel propeller, 30 x 5 wheels, navigation lights. Privately owned and always hangared. AERO DIGEST, Box 1931.

WACO C: '33. Under 200 hours. Ship delivered late '33. Cost $8,200 new. Never cracked, privately owned. High gloss finish. Absolutely perfect. AERO DIGEST, Box 1936.

FRANKLIN automohile engine, rehuilt for aircraft use. Complete with thrust hearing and propeller huh. Ready to run. Will sell cheap. Air Activities Airport, West Chicago, Illinois.

NEW JACOBS 170: Latest type. Guaranteed. Finest A-N spruce, all lengths. McPherson, Ahington, Pennsylvania.

FOR SALE: Warner Aristocrat, 3-place cahin, condition like new; metal prop, hlind flying instruments; never cracked; 100 hours total time; $1,250. R. W. Simpson, Roosevelt Field, Mineola, New York.

1933 WACO CABIN: Looks like new. Ship has special paint joh, electric starter and generator, landing lights, shielded for radio, wired for flares, wing root fairing, air hrakes. Total time only 350 hours. Motor just major overhauled hy Continental with 1935 type sodium cooled valves. Must sacrifice to raise cash hefore Decemher 31st. Rohert E. Hoefflin, 923 W. Greene Street, Piqua, Ohio.

WARNER CESSNA: Total ship time 691 hours, total engine time 430 hours; engine time since major overhaul, 28 hours. Original logs. Ship needs fuselage recovered, new cylinder; price $800; new cylinder availahle here, $65. Serv-Air, Inc., Raleigh, North Carolina.

STINSON J6-9: Less than 20 hours since completely recovered and engine major overhauled; night flying equipment; licensed to June, 1935. J6-7 engine! Less mags and carhuretor. No reasonahle offer refused. Time payments on Stinson to responsihle huyer. Stinson Airport, La Grange, Illinois.

TRAVEL AIR 6000-B: Late series; just overhauled and recovered hy factory. Cluh seats, landing lights, flares and radio. Aero Salvage Company, Jackson Heights, New York.

OX-5 CURTISS ROBIN: Licensed till Decemher, 1935. Excellent condition, $425. AERO DIGEST, Box 1938.

WACO F-2 JACOBS: $1,700 cash or trade on Lycoming Stinson. Ship and motor like new. Total time 200 hours. John Siems, Columhus, Nehraska.

FOR SALE: Curtiss-Sedan, 4-place cahin. New type; 185 Challenger. New covering, special finish. 287 hours total time. Night and hlind equipment. Price $2,000. Trades considered. W. P. Corrington, 1220 West 9th St., Cleveland, Ohio.

TAYLOR CUB: Just relicensed, late new type motor; hlue and silver; covering good. Need cash; $775. Also 125 Waco F, 330 hours, $1,500. Boh Trader, Dravoshurg, Pennsylvania.

WALLACE TOUROPLANE: 4-place, completely overhauled. Continental engine. Airwheels and landing lights. OX-5 Waco, perfect condition; Aerol struts, airwheels. Wanted: Taylor Cuh, Aeronca, Fleet and Waco. Aero-Ways, Inc., Cleveland Airport, Cleveland, Ohio.

VELIE CAVALIER: Licensed until October, 1935. In good condition, $575. Will consider late model light sedan in trade. H. H. Fish, Box 1470, Tulsa, Oklahoma.

KINNER K-5 front exhaust engine. Completely rehuilt hy factory experts. New magnetos, pistons, hearings, guides, etc. Price $450. Pacific Aircraft Motors Co., Glendale, Calif.

OX-5 CHALLENGER: Millerized, dual control, relicensed to July. Must sell; need cash; first $375 gets it. Real hargain. Descomh, 100 Church St., Wethersfield, Connecticut.

SPORTSMAN PILOT will trade or sell P-2 Warner 145 Amphihion, just completely overhauled; total hours, 190. Licensed Novemher tenth. New prop, upholstery, paint joh, control cahles, etc. Plenty extras. Monocoupe preferred. Photo on request. Price, $1,195. AERO DIGEST, Box 1940.

FAIRCHILD KR-21 Taperwing: 100 h.p. Kinner. Metal prop; airwheels; hrakes. Used very little, never commercially. Like new joh. For quick sale, $1,250. A. Lohman, 325 San Gahriel Drive, Rochester, New York.

FOUR USED SHIPS in excellent condition: Keystone Loening Commuter (35 hours since new); 210 Continental Waco (150 hours since new); Challenger (240 hours since new); Stinson S, less left wing. For further information or inspection: Bastil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

● PLANES AND ENGINES FOR SALE

SIKORSKY S-38, 2 WASPS, $10,000: Night flying instruments, radio. J6-5 Travel Air, perfect, $1,075. Challenger Robin, just relicensed, air-wheels, specials, $1,000. Aeromarine-Klemm, new LeBlond, just relicensed, $600. Stearman C3R J6-7, ring, pants, cockpit cowl, $1,875. Continental Airways, Newark Airport, Newark, New Jersey.

FOR SALE OR TRADE: Taper wing Waco, J-5 Wright, speed ring, starter, 35 hours since completely recovered; never cracked up; very fast and snappy. Will trade for cabin; no junk. Descomb, 100 Church St., Wethersfield, Connecticut.

WASP-POWERED 6-place Laird cabin: Just relicensed; 2 hours on engine since major, total time 450. Wonderful freight ship. Make offer, will accept trade-in. Travel Air 2000 parts for sale. Heart of the Lakes Airways, Inc., Lake Delton, Wisconsin.

LATE 90 HORSE Lambert Monocoupe. Perfect condition; steel prop, radio, speed ring. Just relicensed to October 31, 1935. Price, $1,100. Stockert Flying Service, South Bend, Indiana.

CESSNA J6-7: No time since major; just relicensed; navigation lights, bank and turn; very clean, $1,575. Challenger Robin: Air starter, tail wheel, Hamilton prop, navigation lights, $1,195. New Standard Trainer: Kinner, steel prop, 200 hours, looks new, $985. Challenger engine: 500 hours, starter, and Robin mount. New Axelson 155 h.p. engine. Three Irving seat pack pongee chutes, $75 each. Trade or terms. Aviation Service Company, Brainard Field, Hartford, Connecticut.

AERO BARGAINS: A used aircraft directory listing flyaways, crack-ups, motors, parts, and flying equipment. Send 15c now for your copy to Aero Bargains, Greenville, Ohio.

FAIRCHILD 22's, Warner, Cirrus and Gipsy; 24's, Warner and Cirrus. Fleet; Fokker Super Universal; Lockheed Vega; Wasp Laird; Warner and Lambert Monocoupe; Stinson Jr.; Reliant; Travel Air 6000; Stearman; Waco C; Great Lakes; Stinson Trimotors; Bellanca Skyrocket. Aircraft Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

LICENSED COMMAND-AIRE: Recent overhaul; Supreme propeller, compass, duals. Make offer; will give terms or trade; pay as you fly. Pioneer Aircraft, Airport, Syracuse, New York.

THE BIGGEST BARGAIN on the page. Wasp-powered Ireland five-place Amphibion. Just relicensed. Only $1,950. Troy Flying Service, Troy, Ohio.

BARGAINS: Lycoming Stinson, completely rebuilt; Fleet Deluxe, model 7, many extras; Challenger Robin, recovered; Siemens Spartan, recovered, special paint job; Kinner Wallace Touroplane; single-place Aeronca, new engine. All ships licensed. Snapshots furnished if really interested. Indiana Air Service, Airport, South Bend, Indiana.

SAVOIA MARCHETTI: Three-place amphibion. 125 Kinner. Total time since new, 172 hours. 10 hours since motor majored, wing recovered. Ship completely rerigged November 20th. Just relicensed. General condition excellent. Price $1,135. AERO DIGEST, Box 1941.

WACO 90 OX-5: Scintilla magneto; just relicensed; red fuselage, silver wings; new windshield; flyaway for $375. Have complete landing gear for Waco Straight Wing, $50; 2 new Bendix wheels and brakes, tires and tubes, $35; J-5 motor, cheap. Jack Loesing, Hangar 3, Floyd Bennett Airport, Brooklyn, New York.

FAIRCHILD 24: 125 Warner, practically new. Dual controls; privately owned; always hangared. Ideal for instruction or private flying. Priced right. A. D. Warwick, 3531—89th Street, Jackson Heights, New York.

LYCOMING STINSON SM8A: Licensed February, 1935; complete blind flying instruments. Fully equipped for night flying: Wiley flares, retractable landing lights. Over-size semi-balloon tires, air brakes. All equipment excellent condition. Engine recently top overbauled. Fonda, 175 Fifth Avenue, New York City. ALgonquin 4-8738.

ENGLISH GIPSY MOTH: Steel fuselage; perfect condition. 60 hours since complete overhaul, engine and plane. Yellow, black trim. Excellent buy, $700. Fonda, 175 Fifth Avenue, New York City. ALgonquin 4-8738.

1805 CLASSIFIED ADVERTISEMENTS IN 1934!—Here's why:

"Ship sold two days after the DIGEST was out."

DAWN PATROL FLYING CLUB

A. J. (AL) LEEWARD Proprietor

1821 Taylor Ave NEW KENSINGTON PA Phone 841-J

October 29, 1934

Aero Digest
New York City

Gentlemen:

A group of pilots were standing around and were discussing an airplane that was being put up for sale. One of them remarked, "If you have an airplane that you want to sell, why, advertise it in Aero Digest." How true these words were was proven to me when I advertised my Aeronca for sale.

I received 58 answers to my ad, including 8 telegrams. They came from California, Florida, Maine, Canada, Texas, etc. The ship was sold two days after the Digest was out. I am inclined to believe that every prospective buyer depends on Aero Digest to bring him a complete list of used planes that are for sale throughout the country.

Sincerely,

A. J. Leeward

"Sold ship on second inquiry."

FLORIDA SPENCER

WELL EQUIPPED COFFEE SHOP

Floyd W. Thornburg, Prop.

MARION INDIANA

NOVEMBER 21, 34

AERO DIGEST
515 MADISON AVENUE
N.Y. N.Y.

GENTLEMEN:

WE HAVE HAD 52 INQUIRIES TO AT ADS IN THE NOVEMBER ISSUE OF BY MANCH STINSON JR.

SOLD SHIP ON SECOND INQUIRY. ANSWERING OF HENRY POSTAL ALL INQUIRIES ADVISING WRITERS THAT SOLD SHIP AT ADVERTISED CASH PRICE. YOUR PUBLICATION FINE ADVERTISING MEDIUM.

YOURS TRULY,

GENE LAWRENCE
Y. 5259.

"Sold ship for cash two weeks after your October issue was released."

1455 Bernesdale St.
Pittsburgh, Pa.
Nov. 5, 1934.

Aero Digest,
515 Madison Avenue
New York, N. Y.

Gentlemen:

I advertised a Vella Monocoupe for sale in your October issue and I am writing to advise that I received unbelievable results from this advertisement. I received several telegrams and phone calls and numerous letters and postal cards from all sections of the United States and even an inquiry from Tabasco, Mexico, the ship being sold for cash and delivered less than two weeks after your October issue was released.

This certainly establishes your magazine as the leading Aeronautical publication.

Very truly yours,

A. R. Smith

AERONCA COLLEGIAN SEAPLANE: New last June, Perfect condition; corrosion proofed; Edo pontoons, stainless steel wires and control cables, Pioneer compass; motor, propeller and cockpit covers. Donald D. Cooke, Tenafly, N. J.

● WANTED TO BUY OR TRADE

HAVE CASH FOR good Lycoming motor, propeller and starter. Give full description, hours and best price at once. Michigan Aero Motors, Jackson, Michigan.

WANTED TO TRADE: Curtiss-Wrigbt Jr., 45 h.p. Szekely; ship and motor excellent condition; for OX-5 Robin. Must be good condition, located in middle west. Roswell Air Service, Roswell, New Mexico.

WANTED: J-5 Ryan B-1, any condition. Waco 10 lower left wing. Waco 10 rudder bar witb brake pedals. 30 x 5 Bendix wheel for brake. Waco 10 Gruss or Cleveland Aerol struts. Elwyn West, Route One, Menasba, Wisconsin.

WANTED: Taylor Cub. Consider ship needing recovering, repairs or motor conversion. Give full details, lowest price first letter. A. J. Leeward, New Kensington, Pennsylvania.

IMMEDIATE CASH for S-39 Sikorsky amphibion ship, complete or without motor. Send full details. Dr. George Young, Radio Station WDGY, Minneapolis, Minnesota.

WANTED: Cracked Monocoupe, Waco Cabin, Fairchild or Stinson Reliant. For Sale: DH Moth; 4-place Bird; Travel Air 2000, right lower Fleet wing. Southern Airways, Daniel Field, Augusta, Georgia.

WILL TRADE 1929 Kinner-powered General Western 2-place monoplane, top speed excess of 125, has airwheels, air speed, duals, luggage compartment. Not run since motor overhaul. Not licensed; otherwise good condition; for a good licensed plane. Must be worth $500. W. V. Spahr, Minneola, Kansas.

CASH FOR BEST VALUE air-cooled licensable ship, ranging 1-place Aeronca to 4-place Cessna. Also pack parachute. A. E. Thompson, Lakota, North Dakota.

WANTED: Waco 10 upper wings; one left center section strut; one front interplane strut; dural false ribs. W. J. Barry, 9 James Street, Bergenfield. New Jersey.

WANTED: A crack-up, or licensed air-cooled job for casb; or will repair same for you on reasonable terms. Carl Doyle, North Baltimore, Ohio.

CASH FOR K-5 Aerial Camera, copy camera and other photo laboratory equipment. Describe equipment and condition accurately and state lowest price. AERO DIGEST, Box 1923.

WANTED: Kinner or Warner Bird; give full description in first letter. Jobn T. Corrodi, Inc., Box 185, Bexley Station, Columbus, Ohio.

HAVE CASH FOR J-5 Waco, Travel Air or Fleet, or similar ship. Give full description and best price first letter. Glenn W. Fellows, P. O. Box 66, Jackson, Micbigan.

WANTED: 2- or 3-place open or closed ship. For casb or trade. AERO DIGEST, Box 1927.

WANTED: Wright J-6, any model; two J-5's and Warner motors, also parts for same. Give complete description and condition in first letter. AERO DIGEST, Box 1930.

WILL PAY CASH: For airplanes, engines or parts in any condition. Write complete details, prices, etc., in first letter. J. E. Poission, 1219 Penn St., Grand Rapids, Micbigan.

FOR AERONCA C-3: One or both wings. No objection if slightly damaged. Also gas tanks and other minor parts. Air Activities Airport, West Chicago, Illinois.

WILL BUY IMMEDIATELY, for cash: 1933 Stinson, Waco C or Fairchild 24. Also hangar. No trade. Prefer buying from private owner. Dewey Tatro Company, Decorah, Iowa.

WANTED: Great Lakes 1931 or later; must be priced rigbt. Irving seat type parachute, good condition. American Cirrus Upright engine. Moore Flying Service, Box 753, Dayton, Ohio.

LATE MODEL 6-cylinder Coupe, good condition, new tires; Majestic radio, water heater—for cracked-up ship or wbat have you? E. Roos, 2854 W. Washington, Chicago, Illinois.

WANTED: 125 h.p. B Kinner Hamilton metal propeller, huh design 7056, hlade design, 19 B ½ O. AERO DIGEST, Box 1939.

WANTED: Licensed OX Travel Air, Bird or Waco. Consider one needing recover, if cheap. Stuart Holmes, 407 W. Sixth St., Taylor, Texas.

WANTED: J-5 Bellanca or similar plane. With or without motor. Also J-5 rear case and prop. Carl V. Seltzer, 1909 River View Drive, Endicott, New York.

MISCELLANEOUS SERVICES, OPPORTUNITIES, OFFERS, ETC.

WANTED: Financial assistance to huild low cost, high performing, medium powered pursuit ship. This is a new field and at this time should have great possihilities. Inquire Square Shooter, AERO DIGEST, Box 1926.

PRIVATE CONSTRUCTOR offers unusual opportunity to responsihle parties with engines, willing to duplicate aircraft materials for a two-place light plane. Clayton Kennedy, 1038 Third Ave. West, Birmingham, Alahama.

PATENT OFFICE PRACTICE, my specialty; clients' satisfaction, my steady aim; hest results, my ambition. Free hooklet A, with evidence-hlank. Sterling Buck, Permanent Building, Washington, D. C.

LEARN TO FLY: $3 per hour solo; $6 per hour dual, in a 125 h.p. Warner Fleet. Initial fee, $25. Monthly dues, $3. Progressive Aviation Club, Inc., now permanently located at Jamaica Sea Airport, Jamaica, L. I., New York.

KEEP FLYING ALL WINTER: $3.50 solo; $5.50 dual. New ship, cahin heater, hrakes, insurance, 30 minutes from Grand Central hy suhway. Phone, Edwards Flying Service, Flushing Airport, Flushing, L. I. INdependence 3-4843.

BEST EQUIPMENT, LOWEST COST: What more ideal comhination could a student desire to learn flying? Write for description of plan which permits us to give you such unprecedented value in aircraft instruction. Brand new ships assigned exclusively to every unit up to 30 students. Units now heing formed all over the country. U. S. Aero Units, Inc., 122 East 42nd Street, New York, N. Y.

MISCELLANEOUS PRODUCTS AND EQUIPMENT

BROTHER, Can you spare a dime? If you can, send it to me and I'll send you my 1934 Low-Priced Aviation Material Catalog. Karl Ort, 618 W. Poplar St., York, Pennsylvania.

COMPLETE STOCK OX PARTS: Including OX motor, OXX less mags, $45. English Cirrus motor and parts; Avro Avian parts; 22 x 10 x 4 airwheels, roller bearing huhs, adaptors, $45. Earl E. Bach, Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

MOTOR PARTS USED: 70-85% discount. J-5, Lycoming, Velie, OX-5, Hisso, Liherty, D-12. General stock aircraft supplies. Berry's and Cook's finishes. Flottorp propellers. Tapes, fahric, control cahle, etc. Used approved Hamilton steel propellers for Warner Scarah, J-5, Lycoming, Challenger. Orders and inquiries handled same day. Prices are right. J. L. Schroeder Co., Harrishurg Boulevard, Houston, Texas.

FOR SALE: Lycoming Model R. Stinson (large tanks), $2,500. J-5 Travel Air, all white lustre finish, $1,550. One pair 650-10 airwheels, complete with hrakes, $60. One 10 x 3 tail wheel assemhly, $12.50. One 24-foot used Irvin chute, $50. One complete tail group Travel Air Sport; J-6 Series E cylinders, diffuser section, direct electric starter, etc., list less 60%. One J-5 steel propeller, $80. One used J-5 engine, $250. Cash offers and trades considered. Spot cash for crack-ups. Mackey Flying Service, Findlay Airport, Findlay, Ohio.

PROPELLERS: Lowest prices in the country. Steel props for J-6, J-5. A few hrand new Hamilton wood props at $15. We stock Flottorp, Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

ELECTRIC STARTERS for J-5, $40; Wiley flares, reconditioned, $35; new Hamilton hlades for 100 h.p. or less, $30; new K-5 and B-5 exhaust collector rings, $35; new D-2 wahhle pumps, $18; new Pioneer altimeters and tachometers, $14.50; new Eclipse series 6 hand starters, $40; hand starters for Kinner, Warner, etc., $20; used rate of climh and turn and hank indicator, $45; thermocouple, $15; generators with control hox, $65; steel propellers for all engines, $50 up; parachute, white Irvin, $100; magnetos, carhuretors, and parts for all engines at lowest prices. Aero Salvage Co., Jackson Heights, N. Y.

WINGS: Large stock replacement wings ready to ship. Laminated, routed and plain spars. Shipped promptly on order. Also ribs. Chicago Aviation Corp., Glenview, Illinois.

SEMI-AIR WHEELS: 6.10 x 10 Goodrich semi-air wheels with hrakes. Excellent condition, $75. Chicago Aviation Corporation, Glenview, Illinois.

"IF IT FLIES WE HAVE IT": 250 weather-proof Navy flying suits with zipper front and legs, cost $20, now $3.75. 10 x 3, 14 x 3, and 500 x 3 non-skid casings, $4 each. 24 x 4, 26 x 5, 28 x 4, 26 x 3, straight side non-skid, $3.50 each; larger sizes $5 each with tuhes. New Kinner Standard steel propeller, $125; Wasp, Hornet and other sizes from $75 to $150. Parts for Wright Cyclone Model R-1820-F, Wasp and Hornet generators, starters, gears, valves, etc. Remarkahly low prices this month. Brand new Fahrenheit temperature gauges, 12-inch tubes, $1.90. 3½-inch dial, 20,000 foot new altimeters, $3. 18-gauge sheet dural, 35c per pound. Liherty motors, practically new, complete, $50. Hisso, OX-5, Hall-Scott, Lawrance, Cirrus and other motors, $50 to $150. Brand new Siemens-Halske, 70 h.p., $250 in original crates with tools. B. G. 4-B spark plugs, 50c; AC, Champion, Splitdorf, 25c each. Turnhuckles, shackles, clevis pins, nickel steel holts, exceptionally low prices. 10 x 3, 14 x 3, 20 x 4, drop center wheels, $3.50 each. Practically new Aeronca motor, L head Model, $140. Rotary motor generators, 10 volt input, 300 volt output, $10 each, cost $100. See us for hargains. Crawford Airplane Supply Company, Venice, California.

LYCOMING MOTOR: Cracked up J6-9 Laird; Fairchild parts; radio shielding for Lycoming; Westport radio. Aircraft Sales Co., Hangar D, Roosevelt Field, Mineola, New York.

SPARS FOR ALL SHIPS: Waco, Bird, Travel Air in stock. We duplicate other spars promptly. Complete stock all sizes rih spruce. Flightex wing covers. Oleo springs for Waco, Bird, New Standard, N. S. Trainer, Fleet, Stinson, etc. Liheral discounts to repairmen. Get our prices. Air Transport Equipment, Inc., Garden City, New York.

STINSON S SALVAGED PARTS: Including motor and prop, for sale at hargain. Communicate with Box 1941, Winston-Salem, N. C., for further information.

USED WINGS, PARTS: For Waco 10, J-5, Hisso, American Eagle, Travel Air, Bird. Liheral allowance on wrecked wings. Rehuilding wings our specialty. New London Aircraft Co., New London, Ohio.

MOTORS: 2 practically new Cirrus inverted motors, only 12 and 16 hours. J-5 motor, AB series; a good one with standard cylinders and not worn out. New Szekely motors. One good Velie and a lot of motor parts that are good. Sun Aero Motors & Supplies, 10529 Gratiot Ave., Detroit, Michigan.

TIRES AND WHEELS: New 1100 x 12, $22; 950 x 12, $20; 650 x 10, $14; 600 x 10, $12; 30 x 5, $6; 24 x 4, $4. One pair new 650 x 10 wheels, tires, tuhes, hrakes, $85. Pair used 26 x 11-6 tires, tuhes and wheels, less hrakes, $50. Pair 35 x 15-6 tires, tuhes and wheels, $125. Berry Bros. new grade commercial dope, $1.05 gal. in 30 gal. lots. Berry Bros. new thinner at $1 gal. Sun Aero Motors & Supplies, 10529 Gratiot, Detroit, Michigan.

POSITIONS WANTED

TRANSPORT PILOT: 22, single. Wants position doing anything, anywhere, any time. Good references, pay secondary. Write G. W. Gahler, 104 West Broadway, Council Bluffs, Iowa.

YOUNG MAN: 21 years old, office experience, sales experience, Amateur pilot, regular mechanic. Desires position in aviation which will lead to a future. Good worker. Willing to travel. AERO DIGEST, Box 1924.

L. C. PILOT desires position in aviation for experience. Will work hard, go anywhere. Experienced in mechanics. Good references. Lee S. Jones, Jr., Sanford, North Carolina.

LICENSED A & E MECHANIC and Parachute Rigger, U.S.A. Air Corps, commercial experience, P & W factory experience. Go anywhere. AERO DIGEST, Box 1925.

PILOT: 10 years experience; will fly for private party or company. Also licensed mechanic, full ahle to care for own ship. AERO DIGEST, Box 1928.

YOUNG MAN: Age 28, single, high school graduate with 10 years hookkeeping experience, desires position in commercial aviation. Employed at present. AERO DIGEST, Box 1933.

A & E MECHANIC: 27, now in South. Six years' experience all types. Expert at recovering. Want connection with live airport in South. AERO DIGEST, Box 1937.

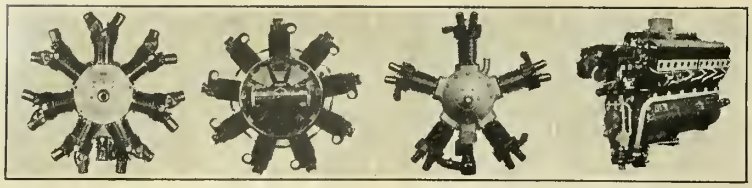
PARACHUTES FOR SALE

PARACHUTES: Approved types; hought, sold, exchanged, repaired, packed, rented. Specify fully requirements. Airports should investigate drawing power of halloon and inexpensive operation for Sunday husiness. Thompson Bros. Balloon & Parachute Co., Aurora, Ill. Estahlished 1903.

IRVING TRAINER 28 pongee hack, 24 white silk chest, excellent, $155. 24 pongee seat pack, Irving, excellent. $85. Parachute instruction texts, $1 each. George de Grange, Bolling Field, Washington, D. C.

IRVIN PARACHUTE: White silk, new, never worn, $150; will give terms. Switlik exhihition chute, 26 hack, 24 chest, white silk. Pioneer Aviation Co., Airport, Syracuse, New York.

INDEX TO ADVERTISERS IN THIS ISSUE



Can you answer these questions?

What does excessive wear on one side of a piston usually indicate?
What is the purpose of the lock spring at the end of the valve-stem of the P & W Wasp engine?
What is the difference between the back-suction and needle valve types of mixture control?
How is the actuating coil of the current regulator connected to the armature circuit?
How is the alignment of a crank-shaft checked?
How is the exact top-center found preparatory to valve-timing the Curtiss Conqueror engine?
What points should be covered in the maintenance of an Eclipse inertia starter?
How are the contact points of the Scintilla SC magneto adjusted?
How would you check the ignition-timing of an engine?
How is the track of a propeller checked after it has been installed?
What are the principal points to cover in the 25-hr. inspection of an engine?
What is the purpose of the glow-plugs used in the Packard-Diesel aircraft engine?
What three ignition troubles may result in difficult starting?
How will too much valve-tappet clearance affect the operation of an engine?
What aircraft parts are normally silver-soldered?

This book answers them—and hundreds more:

Aircraft Engine Mechanics Manual

A Complete Engine Course in Handy Book Form

by **C. J. MOORS,** Chief Instructor, Dept. of Mechanics, Air Corps Technical School, U. S. Army. *536 Pages, 189 Illustrations.* **$4.50.**

EVERY airman, whether veteran or novice, needs this book. The licensed mechanic with many years of experience will find it ideal for daily, on-the-job reference. The beginner who has not yet received his mechanic's license will find it invaluable as a textbook for detailed study. Every pilot and operator can profit greatly from its practical hints on getting the most out of the airplane's power plant.

Mr. Moors deals thoroughly with all types of aircraft engines and their accessory equipment. He explains exactly how they operate and the features in which the various types resemble each other and those in which they differ.

All needed data are given on construction and operation. Full instructions are supplied on maintenance. You are shown exactly how to go about making any necessary repairs and adjustments. Particularly important is the detailed information on locating causes of engine troubles. Nearly 200 photographs, diagrams, and working drawings make it easy for you to follow each explanation. 400 questions enable you to test your understanding of each subject treated.

CONDENSED OUTLINE

Elements of Mechanics: Physical Properties of Metals. Metals for Aircraft Engine Construction. Hand Tools and Metal Working.

Engine Construction and Repair Principles: Internal-Combustion Engine Principles. Types of Engines. Engine Parts. Cooling Systems. Lubricating Systems. Repair Procedure.

Carbureters, Superchargers, Fuels, Lubricants: Carburetion Principles, Zenith and Stromberg Carbureters. Superchargers. Fuels. Lubricants.

Ignition and Electrical Equipment: Principles of Electricity and Magnetism. Principles of Ignition Systems. Magnetos. Generators and Generator Control Units. Storage Batteries. Spark Plugs and Ignition Wiring. Scintilla Aircraft Magneto, Types AG and Y-AG. Scintilla Double Magneto, Type SC. Scintilla Magneto, N. Series. Eclipse Aircraft Electric Generating System. Leece-Neville Aircraft Electric Generating System, Delco Battery-Generator Ignition System. Eclipse Aircraft Engine Starters.

Aircraft Engine Operation and Maintenance: Engine Installation and Operation. Engine Testing. Engine Troubles and Their Remedy. Engine Inspection.

Construction, Repair and Maintenance of Aircraft Engines: Pratt & Whitney Wasp, Wasp Junior, and Hornet Engines. Wright Whirlwind and Cyclone Engines. Curtiss D-12, Conqueror, and Challenger Engines. Lycoming. Packard-Diesel. Warner-Scarab. Kinner. LeBlond. Continental. Liberty Engines.

(fill in, tear out, and mail)

Sent Without Advance Payment on 5 Days' Approval

The Ronald Press Company,
Dept. M824, 15 East 26th Street, New York.

Send me the books checked below. Within five days after their receipt I will either return them or send payment in full at the prices shown plus a few cents for delivery charges. (We pay delivery charges when cash accompanies order—same return privilege.)

☐ **Moors,** Aircraft Engine Mechanics Manual.....**$4.50**
☐ **Lusk,** Aeronautics.....**$3.25** ☐ **Hartz-Hall,** Rigging Handbook..**$3.50**
☐ **Jones,** Practical Flying..... **3.00** ☐ **Carter,** Simple Aerodynamics... **4.50**

Name .....
Home Address.....
City..... State*.....
☐ Employed by,
☐ or Reference..... Address.....
(Above line must be filled in unless you send cash)
* If outside continental U. S. and Canada, send cash plus 25c per book for shipping.

PREPARES FOR ANY LICENSE TEST

Aeronautics
A Ground School Textbook

by **Hilton F. Lusk,** *formerly Dean, Boeing School of Aeronautics.* 175 *illustrations.* **$3.25.**

This book clearly and thoroughly explains all the subjects you need to understand to pass the written part of the government examinations for a license as an airplane pilot in any of the grades—including transport pilot, or as an airplane or engine mechanic. No one who masters it will have any difficulty in answering any question that may be asked in the examination. It is so clearly and simply written that you will have no trouble in understanding its explanations even if you must study at home without the aid of an instructor. The 15 chapters explain just what you need to know about flight principles; airplane construction, operation; engine principles, construction, operation; propellers, blind flying and engine instruments; maps; piloting; dead reckoning; avigation instruments, equipment; meteorology.

CUT THE COST OF YOUR TRAINING

Practical Flying
A Pilot's Training Guide

by **Major B. Q. Jones,** *Air Corps, U. S. Army; formerly Chief of Aviation Training, A. E. F.* **$3.00.**

Your flight training will cost you less and you will be ready to solo many hours sooner if you follow the practical guidance of this famous manual. Thoroughly covers, taxying, the take-off, the initial climb, emergency landings, straight-away flight, glides, turns, figures-of-eight, cross-country flying, stalls and spins, methods of plane inspection, testing controls and motor, etc.

THE VITAL FACTOR IN SAFE FLIGHT

Airplane Mechanics Rigging Handbook

by **R. S. Hartz,** *formerly Lieut. Col., Air Corps, U. S. Army;* and **E. E. Hall,** *formerly Editor, "Aircraft Servicing."* 104 *illustrations.* **$3.50.**

Shows you how to get a plane into proper flying condition and how to keep it that way. Covers in detail sequence of rigging steps, how to true up the assembled ship, how to adjust the wings and control surfaces for "hands off" flying, spars and struts, inspection, installing and checking compasses, fabric, wood and glue, metal parts, wires, dopes, folding and packing parachutes.

FIRST BOOK IN AERO ENGINEERING

Simple Aerodynamics and the Airplane

4th Revised Edition by Colonel C. C. Carter, *U. S. Military Academy, West Point.* 395 *illustrations.* **$4.50.**

This famous textbook is used by the Army cadets at West Point and by students in over 100 leading technical schools, colleges, and flying schools. Everywhere recognized as the outstanding technical book in the aeronautic field, no other book approaches it in popularity or is so widely used.

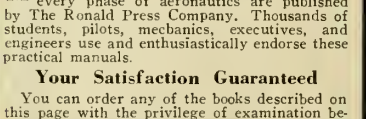
It provides a clear and easily understood explanation of the fundamental aerodynamics involved in the design and operation of the airplane. The scope of the book ranges from the explanation of the fundamentals of air flow and production of lift to the complete airplane, its stability, maneuverability, and performance. Chapters include: Airfoils and Their Selection; Parasite Resistance; Propeller; Complete Airplane; Stability; Control Surfaces; Performance; Dynamic Loads; Materials and Construction; Equipment; Navigation.

"The World's Best Books on Aeronautics"

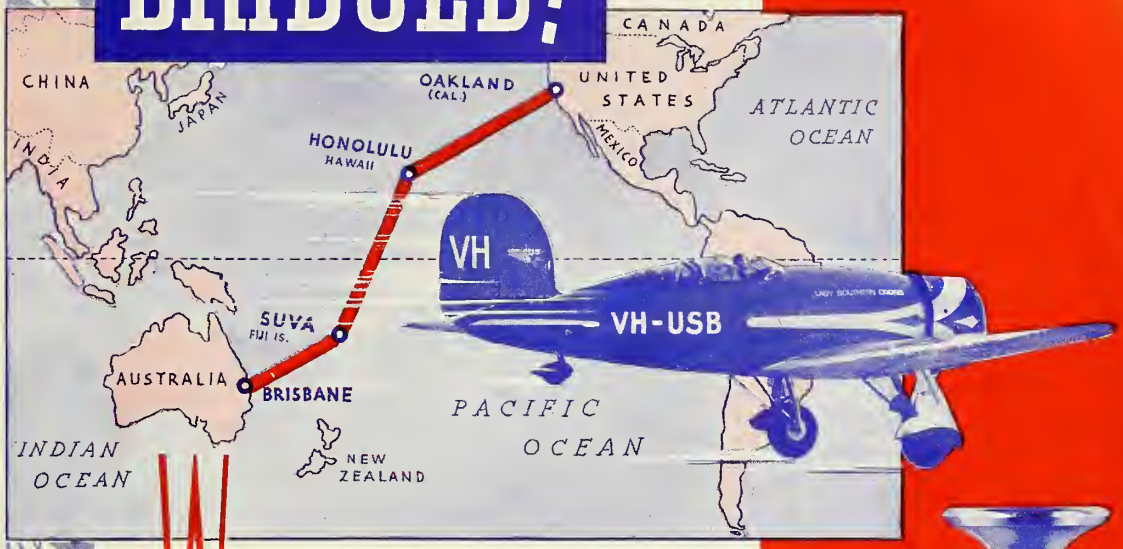
MORE than a score of volumes dealing with every phase of aeronautics are published by The Ronald Press Company. Thousands of students, pilots, mechanics, executives, and engineers use and enthusiastically endorse these practical manuals.

Your Satisfaction Guaranteed

You can order any of the books described on this page with the privilege of examination before purchase. Payment is not due until five days after they are delivered; you can return them within that period if you are not satisfied in every respect.

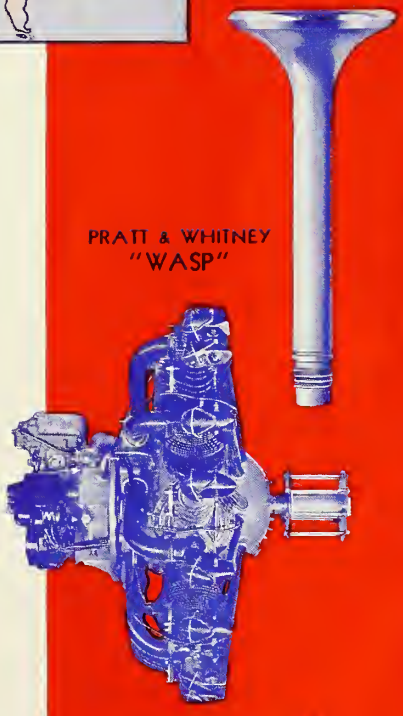


PACIFIC BRIDGED!



WHEN Sir Charles Kingsford-Smith recently completed his flight from Australia to California, he became the first flyer ever to cross and re-cross the Pacific Ocean from Australia. Another remarkable achievement of human skill and mechanical proficiency! Thompson Valves contributed their important share to the perfect performance of the Pratt & Whitney "Wasp" engine which powered Sir Kingsford-Smith's Lockheed Altair plane.

PRATT & WHITNEY
"WASP"



THOMPSON PRODUCTS, Inc.

General Offices: Cleveland, Ohio, U.S.A.
Factories: Cleveland and Detroit

Thompson Valves

Pratt & Whitney Power links "Down Under" with Two Hemispheres

London to Melbourne in ninety-three hours — Brisbone to Ooklond in less than fifty-three flying hours — in these two great flights, totalling nearly twenty thousond miles over four continents, Pratt & Whitney engines add onother poge to their record of dependobility. Yet Wasp and Hornet engines are duplicating this high type of performance as a motter of course on the daily schedules of commercial oir lines throughout the world.